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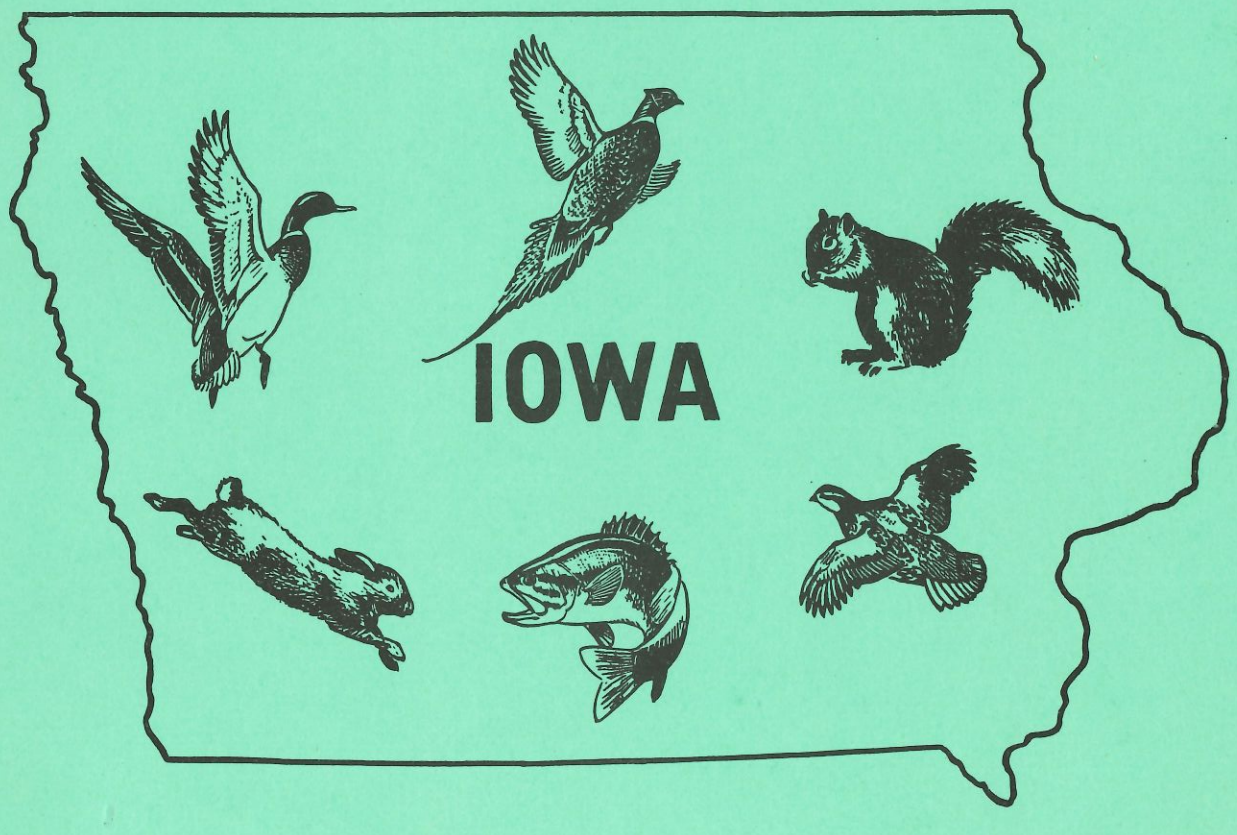

FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

ABSTRACTS

NOTES ON A NEW KIDNEY DISEASE IN HATCHERY TROUT

Robert Schacht
Fisheries Biologist

A new kidney disease was noted in 1966 in hatchery trout at Iowa trout hatcheries. Calcium salt deposits were found in the kidney of rainbow and brook trout causing severe damage. Approximately 33 to 50% of the rainbow trout at two of the hatcheries have the disease. Incidence of occurrence has increased since 1966. The cause is undetermined, but it is suspected that it is a metabolism problem resulting from feed and/or hatchery water. Brown trout have not been greatly affected by the disease. No substantial mortality has resulted from the disease. Results of a pesticide analysis of normal and diseased flesh and kidney of rainbow trout is presented along with analysis of hatchery water. A food study is being carried out to obtain more data on the disease.

AGE AND GROWTH OF CARP IN THE DES MOINES RIVER

Donald Kline
Fisheries Biologist

The second year of commercial and industrial food fish investigations has been completed. A total of 1,349 carp were captured and 360 scale samples were collected for growth studies. Carp in this sample were 12 inches in total length and weighed 1.0 pound between their 4th and 5th year of life. The length-weight relationship for the 1966 sample was Log W = -2.2366 + 2.9648 Log L and in 1967 Log W = -1.9237 + 2.6963 Log L.

COMPARATIVE GROWTH OF CHANNEL CATFISH FROM STUNTED AND NORMAL POPULATIONS

Don R. Helms
Fisheries Biologists

Samples of channel catfish from stunted and normal populations were stocked together in small ponds. A comparison of growth increments indicated growth was more rapid in the stunted fish than in normal stock.

THE EFFECTS OF FISH REMOVAL ON THE CARPSUCKER POPULATION IN CORALVILLE RESERVOIR

Larry R. Mitzner
Fisheries Biologist

Population parameters of growth, condition, mortality and catch success for the carpsucker in Coralville Reservoir has been measured in 1966 and 1967. During 1967, 9,853 pounds of carpsucker and 20,471 pounds of carp, buffalo and channel catfish were removed. There was no difference in the measured parameters after this removal occurred.

AGE OF QUAIL TAKEN BY IOWA QUAIL HUNTERS, 1967-68

M. E. Stempel
Game Biologist

Wings from 1,248 quail shot by Iowa hunters were collected from 19 counties during the 1967-68 season. Eighty-one percent were juveniles. The hatch as determined from wings and from coveys seen in the summer, began in May, peaked in July and remained high into August. After an early start a high rate of hatch was soon reached and maintained over a long period, with a resulting high fall population.

RESULTS OF THE 1967 SHOTGUN DEER SEASON

Paul D. Kline
Game Biologist

Two major changes were made in deer hunting regulations for the 1967 season. First, the state was divided into six, instead of two zones; and quotas for paid shotgun licenses issued were established for each zone. Second, landowner-tenants were required to obtain a licnese, issued free, and return a report card of their hunting effort and success. Of 20,811 paid shotgun hunters, 96.4 percent returned report cards. Of the licensees, 94.7 percent of the paid shotgun and only 71.0 percent of the landowner-tenants hunted. Of those hunting, 38.7 percent of the paid shotgun and 19.0 percent of the landowner-tenants bagged deer. Best success was reported from Zones 1 and 2; poorest from Zone 4. Deer were bagged in every county, ranging from three in Grundy County to 423 in Guthrie County. The total harvest was slightly below that of 1966. Hunting success was lower than previous years. Landowner-tenants bagged considerable more deer than reported from previous years. Hours per deer bagged were 38.8 for paid shotgun hunters and 44.5 for landowner-tenants. Total hours for the season per hunter differed little between two and three day Zones. Of the paid shotgun hunters, 57.3 percent hunted in their home counties; as compared to 93.9 percent of the landowner-tenants. The requirement that landowner-tenants return report cards gave us for the first time a clear picture of this aspect of deer hunting. We learned that paid shotgun hunters spent significantly more effort and were much more apt to bag deer than were the landowner-tenants. Poor hunting success in Zone 4 may reflect over-hunting in that portion of Iowa in recent years.

RESULTS OF THE 1967 PHEASANT HUNTER SURVEY

Richard C. Nomsen
Game Biologist

A random sample consisting of 5.000 names was drawn from the duplicate files of license sales following the 1967 season. A record card and letter of instructions were mailed to each person selected requesting information about the previous hunting season. The survey indicated that 79 per cent (233,800) of the 294,700 resident licensees hunted pheasants during the 52-day season. They bagged a total of 1,134,100 pheasants in 1967. There were 78,100 roosters bagged by 10,500 non-resident hunters. Hunters in Northwest Iowa shot an estimated 11,300 hungarian partridge during the season.

RESULTS OF FORNEY LAKE CONSTROLLED GOOSE HUNTING 1966 & 1967

Richard Bishop
Game Biologist

Ron Andrews
Game Biologist

In 1966 controlled goose hunting regulations were established on a portion of the Forney Lake state management area in Fremont County in southwest Iowa. Twenty-five blinds were constructed prior to the hunting season and blind reservations were issued on a first come first serve basis. In 1966, 1,109 hunters shot 802 geese in the controlled area or .72 geese per hunter. In 1967, 2,073 hunters bagged 554 geese or .27 geese per hunter. Of the 802 geese bagged in 1966, 273 blue geese, 503 snow geese, 7 Canada geese, 6 Hutchinson geese, and 8 white-fronted geese were taken. In 1967, 219 blue geese, 308 snow geese, 5 Canada geese, 10 Hutchinson geese, and 6 white-fronts were bagged. Immature per adult age ratios varied from 1.64 immatures per adult in 1966 to .60 immatures per adult in 1967. Differential migration flights and weather patterns were probably the reasons for the reduced kill in 1967.

NOTES ON A NEW KIDNEY DISEASE IN HATCHERY TROUT

Robert Schacht
Fisheries Biologist

A new hatchery trout kidney disease was first observed in the fall of 1966 when a curious trout fisherman brought a trout he had caught into the Backbone trout hatchery and wanted to know what was wrong with it. The fisherman recognized the kidney of the trout he had caught did not look quite normal. Examination showed the kidney to be swollen with a whitish material deposited in the tubules. Samples of diseased fish were sent to the La Crosse Fish Control laboratory and the Eastern Fish Disease laboratory at Leetown, West Virginia for analysis. Results of these examinations showed the material deposited in the kidney to be a calcium salt mostly phosphate. Advanced stages of this disease caused severe kidney damage. No evidence has been found that it is caused by any kind of infection. The cause is not known, but it is believed to be a metabolism problem resulting from trout feed and/or hatchery water. Other than these few basic facts very little is known about this disease. It may have existed for some time but was not noticed because no abnormal mortality resulted. A similar disease has been reported in West Virginia, Utah, and France, but little about its cause or cure is known.

The kidney of freshwater fish uses the tubule to reabsorb needed salts and other materials. In the diseased fish these salts (mainly calcium phosphate) are being deposited and not absorbed. In advanced stages of this disease the kidney becomes greatly swollen with the deposited calcium phosphate material in both a solid and fluid state. These deposits are usually found in the posterior portion of the kidney, and may with advanced stages of swelling, take up a good portion of the body cavity. Diseased fish are first noted with this disease at one year of age, but it is postulated it does start early in young fish. Various stages of the disease can be found in affected fish from the beginning of a small white line in the tubule to the advanced deposit and swelling.

Further investigation determined that this disease existed in a high proportion of rainbow trout at one Iowa trout hatchery. Since that time the Iowa Conservation Commission has been working to find out more about this disease. Close cooperation with the U.S. Fish and Wildlife Fish control Laboratory at La Crosse, Wisconsin has led to important initial investigation.

The first step in the investigation of the kidney disease was to monitor the per cent occurrence of fish with the disease at each hatchery. Beginning in the fall of 1966, sampling was initiated at the three hatcheries. Brown trout were found to be normal in initial checks subsequent samples except at one hatchery. Over 200 brown trout have been checked since 1966. On March 11, 1968 a fish kill at Big Spring hatchery provided a sample of 100 browns which were checked for the disease. One positive individual was found. As of spring 1968, brown trout are considered relatively free of this disease.

Brook trout raised in 1966 at Backbone hatchery and stocked in 1967 were heavily affected by kidney disease. Exactly one-half of the brooks checked in two years had calcium deposits and many of these were in advanced stages. Small numbers were stocked in 1962 and 1967. In 1968 several thousand are being raised at Big Spring hatchery for stocking in 1969. It is

expected that a high percentage of these fish will develop the disease, but only future sampling will determine its extent.

Rainbow trout has developed the kidney disease at Decorah and Big Spring hatcheries (Table 1) The most marked increase occurred at Decorah hatchery with an increase from 6 per cent in December 1966 and March 1967 to 50 per cent in November 1967. Big Spring hatchery showed an increase from nearly 40 per cent in March and November 1967 to 50 per cent in February and March 1968.

Because the rainbow trot is of utmost importance to the Iowa trout program (nearly 70 per cent of the trout raised for stocking are rainbow trout), a feeding study was initiated in December of 1967. It was postulated that the lowering of the pH in the kidney by the addition of citric acid to the feed would alleviate the problem. Further, it was thought the effects of acid addition would help only in early stages of the disease. Where the deposits were already well advanced only a halt of further deposition could be expected. However, not knowing the cause of this disease the treatment was speculative. This study was set up at this time to gather what information could be found on the disease. Only further long term study using fish from the egg stage can provide additional data on this disease. In the study two lots of rainbow trout were set up at each hatchery using yearling fish. One lot was to be fed the normal diet and the other lot was fed the same diet with the citric acid. The fish were fed at the rate of 1 3 percent of the total body weight established by monthly sample weights. The acid, in granular form, was added to the pelleted feed with A and D feeding oil. The acid was mixed each day at the hatcheries and fed at 1.3 grams per hundred pounds of fish

Table 1. Per cent of incidence of kidney disease in rainbow trout at the Iowa trout hatcheries

Sample date	Location	Number in sample	Per cent incidence
Fall 1966*	Big Spring	64	23%
3/13/67	Big Spring	79	42%
11/20/67	Big Spring	100	38%
1/10/68	Big Spring	50	50%
3/11/68	Big Spring	150	53%
12/22/66	Decorah	18	6%
3/17/67	Decorah	50	6%
1/10/67	Decorah	50	54%
12/12/66	Backbone	10	10%
March 1967*	Backbone	26	0%
10/5/67	Backbone	20	0%
11/20/67	Backbone	20	5%
12/8/67	Backbone	100	0%

* Total of several samplings

flesh. The acid dosage was doubled on March 1st. A twenty fish sample was taken from each lot monthly and taken to the hatchery biologist at the U S. Fish and Wildlife Fish Control Laboratory at La Crosse, Wisconsin for analysis. Results of three months of the feeding study indicate the acid may be helping although it is too early to draw any final conclusions. The lots being fed the acid diet show a lower incidence than the control lots (Table 2). These tests are being continued until more data can be obtained in order to determine if new tests are advisable.

Water analysis was made at monthly intervals for the three Iowa trout hatcheries. Both Elkader and Big Spring hatcheries have a "hard" water source expressed as over 300 p.p.m. hardness as $CaCO_3$. Backbone hatchery water is considered "medium" with a $CaCO_3$ hardness of 200 p.p.m. The available calcium and phosphate is higher at both hatcheries with the disease than at Backbone where the disease has not developed in rainbow trout. However, it has been reported this disease has been found in hatcheries in other states having soft water source (Table 3).

An analysis of the flesh and kidney of both normal and diseased rainbow trout was made at the State Hygienic Laboratory in Iowa City to determine pesticide residues. Fish were collected at Decorah and Big Spring hatcheries. Results of these tests show no abnormal concentrations of pesticides DDT, DDE, DDD, Lindane, and Dieldrin. DDT and DDE showed the highest concentrations in the flesh and kidney samples of both normal and diseased fish. DDT concentrations for the muscle of both normal and diseased fish were similar with values of 0.1 p.p.m DDT and 0.2 p.p m. DDE at both hatcheries. Both hatchereis also showed a similar concentration of DDT and DDE in the normal kidney and approximately one half of this concentration in the diseased kidney (Table 4).

Table 2. Number of rainbow trout affected by the kidney disease in the feeding study groups

Station	Date	Acid fed group		Control group	
Decorah	Jan.	3/20	(15%)	7/20	(35%)
Decorah	Feb.	8/20	(40%)	8/20	(40%)
Decorah	March*	3/20	(15%)	5/20	(25%)
	3 month total	14/60	(23%)	20/60	(33%)
Big Spring	Jan.	3/20	(15%)	7/20	(35%)
Big Spring	Feb.	5/20	(25%)	16/20	(80%)
Big Spring	March*	9/20	(45%)	7/20	(35%)
	3 month total	17/60	(28%)	30/60	(50%)

* acid doubled

SUMMARY

1. The cause of this disease is not known. No evidence has been found to show that it is caused by an infection of any kind. It is believed to be a metabolism problem resulting from the trout feed and/or hatchery water but more evidence must be gathered before this can be proven

2. The diseased fish show no signs of distress or odd behavior although damage to the kidney may be severe. No abnormal mortalities have resulted that can be attributed to the disease.

3. The disease is recognizable in its early stages by an abnormal whitish deposit in the kidnye tubules. The deposited material is a calcium salt most often deposited as a phosphate. Advanced stages of the disease are marked by heavy deposits of this material in the posterior portion of the kidney.

4. An increase in the incidence of the disease in rainbow trout has been noted at Decorah and Big Spring hatcheries since 1966. At present approximately one-third to one-half of the rainbow trout at Big Spring and Decorah hatcheries have the disease.

5. The brown trout is relatively free of this disease in the Iowa hatcheries. One fish of several hundred that were sampled was found to have the disease.

6. Brook trout developed the disease at Backbone hatchery in 1966. Most of these fish have been stocked except for some held over as brood fish.

7. Although all hatcheries use the same trout feed the disease has developed in only two of the three hatcheries in the rainbow trout.

8. Analysis of spring water sources show the two hatcheries with the disease to be classified as "hard" water with a calcium carbonate hardness of over 300 p.p.m.. The hatchery without the disease has a "medium" hardness of 200 p.p.m. calcium carbonate.

9. Pesticide analysis of the muscle and kidney of normal and diseased rainbows shows no abnormal concentrations of pesticides DDT DDE, DDD. Lindane and Dieldrin. However, diseased kidneys showed approximately one half the concentration of these pesticides than did the healthy kidneys.

10. Studies are continuing to obtain more information on this disease.

Table 3. Analysis of hatchery water source expressed as parts per million

Location of Spring:	Decorah	Elkader	Strawberry Point
Date of Sample	27 Feb. 68	27 Feb. 68	27 Feb. 68
Temp. at Collection	49°	47°	48°
Spec Conductance	62	62	40
Total Solids	387	389	233
Total Iron	0.10	0.30	<0.02
Silica (Si 02)	13	16	10
pH	7.3	7.2	7.5
K ion	3.1	4.0	0.9
Na ion	4.2	8.1	4.8
Ca ion	88.0	80.0	51.2
Mg ion	29.2	32.1	18.5
Mn ion	0.11	0.39	< 0.05
No3 ion	5.0	7.8	23.0
F- ion	0.4	0.15	0.1
Cl- ion	4.0	6.5	7.5
So4 - ion	39.0	39.0	27.0
H C03 ion	364	364	195
C03 --ion	none	none	none
Hardness as CaC03	340	332	204
Soluble Phosphate	0.4	1.3	< 0.1
Total Phosphate	0.5	1.6	< 0.1

Table 4. Pesticide concentrations in normal and diseased rainbow trout expressed as parts per million

	DDT	DDE	DDD	op DDT	Lindane	Dieldrin
MUSCLE						
Decorah						
Normal	0.088	0.166	0.042	0.011	0.013	0.027
Diseased	0.120	0.211	0.049	0.019	0.010	0.012
Big Spring						
Normal	0.108	0.175	0.049	0.017	0.027	0.007
Diseased	0.094	0.184	0.035	0.008	0.020	0.015
KIDNEY						
Decorah						
Normal	0.114	0.230	0.048	0.019	0.021	0.012
Diseased	0.048	0.115	0.019	0.006	0.009	0.006
Big Spring						
Normal	0.093	0.192	0.038	0.016	0.002	0.017
Diseased	0.037	0 108	0.017	0.008	0.004	0.004

AGE AND GROWTH OF CARP IN THE DES MOINES RIVER

Donald Kline
Fisheries Biologist

A three year study is under way to determine the effects of commercial fishing on a large inland stream[1]. The purpose of the study is to determine the effects of increased harvest on remaining fish populations without jeopardizing the sport fishery. The study area is a 20 mile segment of the Des Moines River near Knoxville, Iowa, in Marion County. Fish with commercial or industrial value, including channel catfish, carp, carpsucker and flathead catfish are being exploited under controlled conditions.

Netting started on May 19 and continued through November 4, 1967. Baited hoop nets and slat traps were used to exploit the fish populations. Nets were raised, emptied and rebaited at 24 hour intervals on week days. A total of 1,349 carp were captured during the netting period. All these carp were removed from the study area. Total length, weight and scale samples were obtained from 360 carp for age and growth studies.

Scale samples were taken from an area three scale rows below the insertion of the dorsal fin. Three scales from each fish were cleaned, mounted dry between two glass slides and examined by microprojection at a magnification of 17X. Annuli were marked on paper tagboard strips that extended from the focus to the anterior margin of the scale.

The location of annuli was difficult in fish more than 9 years old. Annuli were closer together near the edge of the scale making it difficult to distinguish between false and true annuli. It was also apparent carp did not lay down annuli some years or they were absorbed. No carp from age group 0 were captured.

LENGTH-WEIGHT RELATIONSHIP

The 1967 length-weight relationship was used for comparison with the 1966 relationship to determine if exploitation at a controlled rate had any effect upon the length-weight relationship or condition factors.

The sample was divided into ½-inch size groups and the means for each group plotted on Figure 1. The length-weight relationship was computed by the least squares procedure and is best expressed by the equation:

$$\text{Log } W = -1.9237 + 2.6963 \text{ Log } L$$

where L = total length

and W = weight

The resulting regression line was fitted to the plotted means.

Table 1 Observed and calculated weight of carp in Des Moines River, 1967

Size Group	Mean Length	"C"	Mean Weight Observed	Mean Weight Calculated	Deviation c/o	Number in Group
4.5-4.9	4.6	102	.10	.13	+ .03	1
7.0-7.4	7.3	77	.30	.25	- .05	1
8.0-8.4	8.2	54	.30	.35	+ .05	1
9.0-9.4	9.3	53	.43	.49	+ .06	3
9.5-9.9	9.7	62	.57	.55	- .02	3
10.0-10.4	10.2	58	.61	.63	+ .02	5
10.5-10.9	10.7	49	.60	.71	+ .11	4
11.0-11.4	11.2	53	.74	.80	+ .06	7
11.5-11.9	11.8	55	.90	.93	+ .03	4
12.0-12.4	12.3	54	1.00	1.04	+ .04	13
12.5-12.9	12.7	48	.99	1.13	+ .14	10
13.0-13.4	13.2	54	1.23	1.25	+ .02	24
13.5-13.9	13.8	50	1.31	1.41	+ .10	14
14.0-14.4	14.2	50	1.44	1.53	+ .09	22
14.5-14.9	14.7	49	1.54	1.67	+ .13	18
15.0-15.4	15.2	50	1.76	1.83	+ .07	23
15.5-15.9	15.8	48	1.91	2.03	+ .12	19
16.0-16.4	16.2	51	2.16	2.18	+ .02	19
16.5-16.9	16.8	49	2.32	2.40	+ .08	14
17.0-17.4	17.2	51	2.61	2.55	- .06	9
17.5-17.9	17.7	52	2.90	2.76	- .14	9
18.0-18.4	18.1	52	3.09	2.93	- .16	12
18.5-18.9	18.6	48	3.10	3.16	+ .06	7
19.0-19.4	19.1	50	3.49	3.49		14
19.5-19.9	19.6	50	3.76	3.63	- .13	16
20.0-20.4	20.1	48	3.90	3.89	- .01	11
20.5-20.9	20.6	47	4.06	4.16	+ .10	5
21.0-21.4	21.1	48	4.50	4.44	- .06	12
21.5-21.9	21.7	49	5.05	4.79	- .26	4
22.0-22.4	22.1	45	4.83	5.03	+ .20	6
22.5-22.9	22.6	48	5.53	5.34	- .19	4
23.0-23.4	23.3	51	6.40	5.80	- .60	6
23.5-23.9	23.6	49	6.46	6.00	- .46	9
24.0-24.4	24.1	45	6.28	6.35	+ .07	4
24.5-24.9	24.7	45	6.72	6.78	+ .06	6
25.5-25.9	25.7	48	8.10	7.55	- .55	1
26.0-26.4	26.1	48	8.60	7.87	- .73	3
27.0-27.4	27.2	47	9.35	8.80	- .55	2

The observed and calculated values of weight (Table 1) are not significantly different ($t = 0.508$; $p < 0.500$). Greatest deviations occurred in the larger carp.

ANALYSIS OF LENGTH AND WEIGHT

The length-weight relationships were based on samples of 165 fish in 1966 and 345 fish in 1967. The length-weight relationships for the two years was as follows:

$$(1966)\quad \text{Log } W = -2.2366 + 2.9648 \text{ Log } L$$

$$(1967)\quad \text{Log } W = -1.9237 + 2.6963 \text{ Log } L.$$

Analysis of covariance (Table 2) indicates that there is significant difference ($F=56.25$) between the length-weight regressions. Carp were heavier for their length in the 1966 sample than in 1967. Because of the significant difference in regressions the difference between adjusted weight means was also significant ($F=70.21$). This analysis reveals carp in the 1966 sample had greater weight, at the same unit length, than carp in the 1967 sample.

Table 2. Analysis of covariance to test the differences between the length-weight regressions of the carp in 1966 and 1967

Test of regression coefficients :

Source	Errors of estimate d.f.	SS	MS
Average within years	74	1.8237	0.0246
Deviations from individual regressions	73	8.2962	.1136
Differences between regression coefficients	1	-6.4252	-6.4252

$$F = \frac{-6.4252}{.1136} = 56.56^{*};\ 1 \text{ and } 73 \text{ d.f.}$$

Test of adjusted means:

Source	d.f.	Sx^2	Sxy	Sy^2	Errors of estimate d.f.	SS	MS
Total	76	-6.6468	-.6777	1.4159	75	.1439	
Between years	1	.0357	-.0476	-13.2596			
Within years	75	-6.7825	-.7253	-11.8437	74	1.8237	.0246
Differences for testing adj. means					1	-1.7271	-1.7271

$$F = \frac{-1.7271}{.0246} = 70.21^{*};\ 1 \text{ and } 74 \text{ d.f.}$$

* significant at the 0.05 per cent level.

BODY-SCALE RELATIONSHIP

Mean total length (L) by 1 inch size intervals and scale radius (R) by 0.1 inch intervals were plotted on Figure 2. The equation:

$$L = -0.3 + 2.63\ R$$

is the best expression of this relationship.

An intercept of -0.3 inches on a straight line nomograph was used to compute total length at the end of each year of life.

AGE AND RATE OF GROWTH

Carp increased in length faster during their first years of life and increased in weight faster during their later years (Table 3). Carp were 12 inches long and weighed 1.0 pound between their 4th and 5th year of life. Early in their sixth year of life they attained total length of 15 inches and weighed 2.0 pounds. Summation of grand average calculated increments for 14 years of life were 3.4, 5.9, 8.6, 11.0, 13.4, 15.5, 17.4, 19.1, 20.8, 22.3, 23.8, 24.8, 25.9 and 26.7 inches respectively. Corresponding calculated weights were 03, .14, .39, .76, 1.30, 1.93, 2.64, 3.39, 4.27, 5.15, 6.14, 6.86, 7.71 and 8.37 pounds respectively. Growth of carp in this study was slower in comparison with other studies in the Des Moines River (Rehder, 1959; Mayhew and Mitzner, 1966).

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Table 3. Calculated lengths and weights of carp, Des Moines River 1967

Year Class	Number in Group	Age Group	Total length at each annulus													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1966	1	I	3.4													
1965	16	II	3.6	6.2												
1964	51	III	3.6	6.7	10.1											
1963	68	IV	3.7	6.8	9.8	12.3										
1962	57	V	3.5	7.0	9.9	12.2	14.3									
1961	29	VI	3.3	5.9	8.3	11.1	13.9	16.1								
1960	30	VII	3.8	6.2	8.6	11.0	13.6	16.0	17.9							
1959	18	VIII	3.7	6.2	9.1	11.9	14.2	16.4	18.3	19.8						
1958	15	IX	3.3	6.2	8.7	11.3	13.6	15.7	17.6	19.4	21.0					
1957	4	X	3.1	5.4	8.4	10.4	12.8	15.0	16.8	18.1	20.1	21.7				
1956	3	XI	3.7	5.6	7.8	10.4	12.4	14.2	16.1	18.3	20.1	21.5	22.5			
1955	5	XII	3.5	5.3	8.1	9.8	12.4	14.5	16.3	17.7	19.3	20.8	22.1	23.2		
1954	5	XIII	2.5	4.3	6.0	7.9	10.4	12.0	13.9	16.5	18.7	20.6	22.2	23.2	24.2	
1953	3	XIV	3.1	5.2	7.8	10.1	12.7	15.4	17.5	18.7	19.4	20.6	22.8	23.8	25.1	25.9
Grand avg. cal. length			3.4	5.9	8.6	10.8	13.0	15.0	16.8	18.4	19.8	21.0	22.4	23.4	24.7	25.9
Increment of grand avg.			3.4*	2.5	2.7	2.2	2.2	2.0	1.8	1.6	1.4	1.2	1.4	1.0	1.3	1.2
Grand avg. cal. increment			3.4*	2.5	2.7	2.4	2.4	2.1	1.9	1.7	1.7	1.5	1.5	1.0	1.1	.8
Sum of increments			3.4*	5.9	8.6	11.0	13.4	15.5	17.4	19.1	20.8	22.3	23.8	24.8	25.9	26.7

* Based on Grand average calculated length

COMPARATIVE GROWTH OF CHANNEL CATFISH FROM STUNTED AND NORMAL POPULATIONS

Don R. Helms
Fisheries Biologist

Fish growth in natural populations is largely controlled by inter- and intraspecific competition for available feed and space. In extremely dense populations, growth of some fishes becomes retarded and the fish are said to be stunted. Stunted fish have been demonstrated to exhibit increased growth through reduction of population density or moving the fish to an uncrowded environment. Although it is known that stunted fish will respond to an uncrowded environment, it has never been clearly demonstrated whether the resulting growth rate is comparable to the growth of fish that are not stunted.

The following study compares growth rates of stunted fish with growth rates of normal fish subjected to similar conditions.

METHODS

Channel catfish from two populations known to have widely divergent growth rates were selected for study. Slow growing fish were obtained from the Wapsipinicon River at Anamosa and rapidly growing fish were obtained from the Mississippi River. Fish of two sizes were used from each area. These were 7 to 9-inch and 11 to 13-inch fish and will subsequently be referred to as Groups I and II respectively.

Six erosion control ponds were each stocked with 22 fish. One-half of the fish stocked in each pond were from the Mississippi River and one-half from the Wapsipinicon River. Exceptions are pond numbers 2 and 4, which due to a lack of a sufficient number of fish from the Mississippi River, were stocked with only 7 fish from this group. Fish from the Wapsipinicon River were marked by removing the right pelvic fin, and the left pectoral fin was from Mississippi River fish. Ponds varied from 0.08 to 0.21 surface acres when they were stocked. Maximum depth ranged from 3 to 5 feet. Stocking was completed between May 25 and June 8.

On November 17, fish were recovered with a toxicant, weighed, measured and a pectoral spine for aging collected. Size of individual fish at time of stocking was determined by back calculating growth. It was assumed that the last annulus formed at the time of stocking.

RESULTS

Mean lengths at stocking for fish recovered are presented on Table 1. As a result of variation between ponds, mean length increments of fish stocked in different ponds varies from 1.54 to 3.70 inches for Group I fish and 1.48 to 1.84 for Group II (Table 2).

Stunted fish grow more rapidly than the normal fish in five ponds; however, the reverse occurred in pond number 2. Analysis of variance indicate no significant difference in increments between the stunted and normal groups at the 0.05 per cent level of confidence.

Table 1. Mean initial lengths of two size-groups of stunted and normal channel catfish recovered from individual ponds

Group	Pond	Stunted	Normal	Combined
I	1	8.10	7.96	8.03
	2	8.31	7.17	7.90
	3	8.72	7.10	8.15
	Combined	8.41	7.54	8.04
II	4	11.89	11.24	11.69
	5	11.59	12.56	12.07
	6	11.85	12.75	11.81
	Combined	11.79	11.98	11.87
I & II	Combined	10.19	9.76	

Table 2. Mean growth increments of two size-groups of stunted and normal channel catfish recovered from individual ponds

Group	Pond	Stunted	Normal	Combined
I	1	4.04	3.39	3.70
	2	3.14	3.72	3.35
	3	1.63	1.37	1.54
	Combined	2.83	2.85	2.84
II	4	1.55	1.32	1.48
	5	1.88	1.80	1.84
	6	1.64	1.43	1.56
	Combined	1.68	1.57	1.64
I & II	Combined	2.22	2.21	

THE EFFECTS OF FISH REMOVAL ON THE CARPSUCKER POPULATION IN CORALVILLE RESERVOIR

Larry R. Mitzner
Fisheries Biologist

Rounsefell (1953) states that parameters of a fish population such as, decrease in age, increase in growth and condition and a decline in catch success can be used to detect a decline in the abundance of available stock.

The carpsucker in Coralville Reservoir is unharvested by anglers (Mitzner 1967) and until 1967 was subjected only to natural mortality. Vital statistics of this population were measured in 1966 before removal and again in 1967 when fish removal was occurring. It is essential to know if this removal effected the remaining population.

Scale samples were collected during 7 bi-weekly periods in 1966, commencing June 18; and 10 bi-weekly periods in 1967 from March 26. These samples were taken in the area designated as the pool. The total sample consisted of 1,249 scales.

Length-weight relationship

Length-weight relationships were calculated independently by the least squares method for 1966 and 1967 (Figure 1). The general logarithmic formula Log W = a + b Log L was used to describe this relationship. The resulting equation for 1966 was:

$$\text{Log } W = -3.259 + 2.921 \text{ Log } L;$$

and for 1967 this relationship was best expressed by the equation:

$$\text{Log } W = -3.604 + 3.256 \text{ Log } L$$

where W equals weight in pounds and L equals total length in inches.

A Student t-test was used to evaluate difference in regression between the two years. The result was not significant ($p < 0.05$) and there is no difference in length-weight relationship from 1966 to 1967.

Body-scale relationship

Body-scale relationships for 1966 and 1967 were calculated independently. The formula L = a + b R was used to describe the relationship by the least squares method. In 1966 the resulting formula:

$$L = -0.940 + 2.400 R$$

was obtained where L equals standard length in inches and R equals scale radius in inches, times 17. For 1967 this formula was:

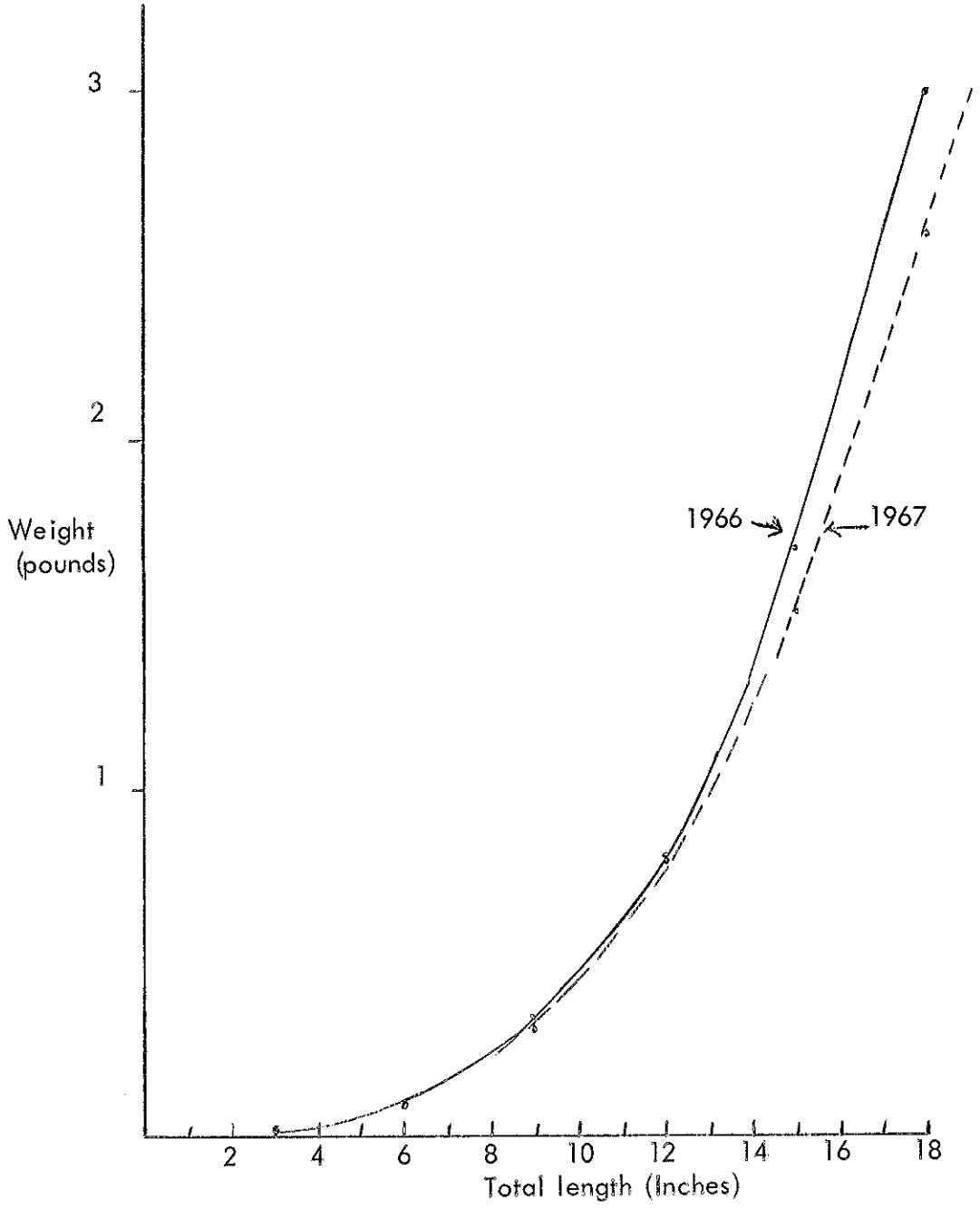

Figure 1. Length-weight relationship of carpsucker in Coralville Reservoir in 1966 and 1967.

$$L = -0.246 + 2.998\ R$$

These relationships were used to construct nomographs for use in back calculation of the lengths at each year of life.

Description of growth - 1966

Calculated lengths were the same among bi-weekly periods and were combined by weighted averages (Table 1).

Table 1. Grand average calculated lengths of carpsucker in Coralville Reservoir, 1966

Year Class	Age Group	Year of life								
		1	2	3	4	5	6	7	8	9
1965	I	3.3								
1964	II	2.2	7.2							
1963	III	3.2	8.5	12.9						
1962	IV	2.5	8.2	12.5	14.8					
1961	V	2.6	6.2	10.3	13.4	15.3				
1960	VI	2.4	6.2	9.6	12.9	15.0	16.5			
1959	VII	1.9	4.8	7.8	10.5	13.4	15.4	17.0		
1958	VIII	1.7	4.7	7.1	9.7	11.9	14.1	16.1	17.6	
1957	IX	2.0	5.1	8.7	11.2	13.4	14.6	16.0	17.2	18.1
Calc. length		2.4	6.4	9.8	12.1	13.8	15.1	16.3	17.4	18.1
Calc. incrt.		2.4	4.1	3.6	2.7	2.3	1.7	1.6	1.4	0.9
Mean weight*		.01	.13	.47	.94	1.52	2.08	2.75	3.35	3.84

* determined from cumulative grand average calculated increments

Greatest growth occurred during the second year of life, when 4.1 inches of growth was achieved. Growth decreased steadily thereafter. Increments of weight was linear from the third to the ninth year. Carpsucker weighed 3.84 pounds after 9 years of growth.

Description of growth - 1967

The sample collected in 1967 was treated identical with 1966. The results are listed in Table 2. Empirical growth in 1967 and the back calculated growth for the next oldest age group in 1966 was the same from the sample collected in 1967. Growth in 1966 from the 1966 sample and empirical growth for the previous year class in 1967 were also identical. Samples in future years will either substantiate or disprove this similarity.

The data between years was similar and a Student t-test was used to determine if any statistical difference existed between 1966 and 1967 for each calculated year of life. All years of life were not significant at the 2 per cent level of probability. Data for the two calendar years were combined by weighted means (Table 3 and Figure 2).

Table 2. Grand average calculated lengths of carpsucker in Coralville Reservoir, 1967

Year Class	Age Group	Year of Life									
		1	2	3	4	5	6	7	8	9	10
1966	I	3.6									
1965	II	3.5	9.2								
1964	III	2.9	8.0	12.5							
1963	IV	3.1	8.3	12.4	14.7						
1962	V	2.9	7.7	11.5	14.0	15.8					
1961	VI	2.6	7.0	10.6	13.3	15.1	16.6				
1960	VII	2.3	6.1	9.6	12.3	14.1	15.9	17.1			
1959	VIII	2.6	6.2	9.0	11.3	13.6	15.2	16.8	17.9		
1958	IX	2.9	7.3	11.5	12.9	14.7	15.5	17.4	19.0	19.7	
1957	X	1.8	5.0	8.0	9.9	12.0	13.8	15.3	16.1	16.8	17.7
Calc. length		2.8	7.2	10.6	12.6	14.2	15.4	16.6	17.7	18.3	17.7
Calc. incrt.		2.8	4.5	3.7	2.3	1.9	1.5	1.5	1.2	0.7	0.9
Mean weight*		.01	.16	.60	1.11	1.74	2.39	3.16	3.90	4.37	5.02

* Determined from cumulative grand average calculated increments.

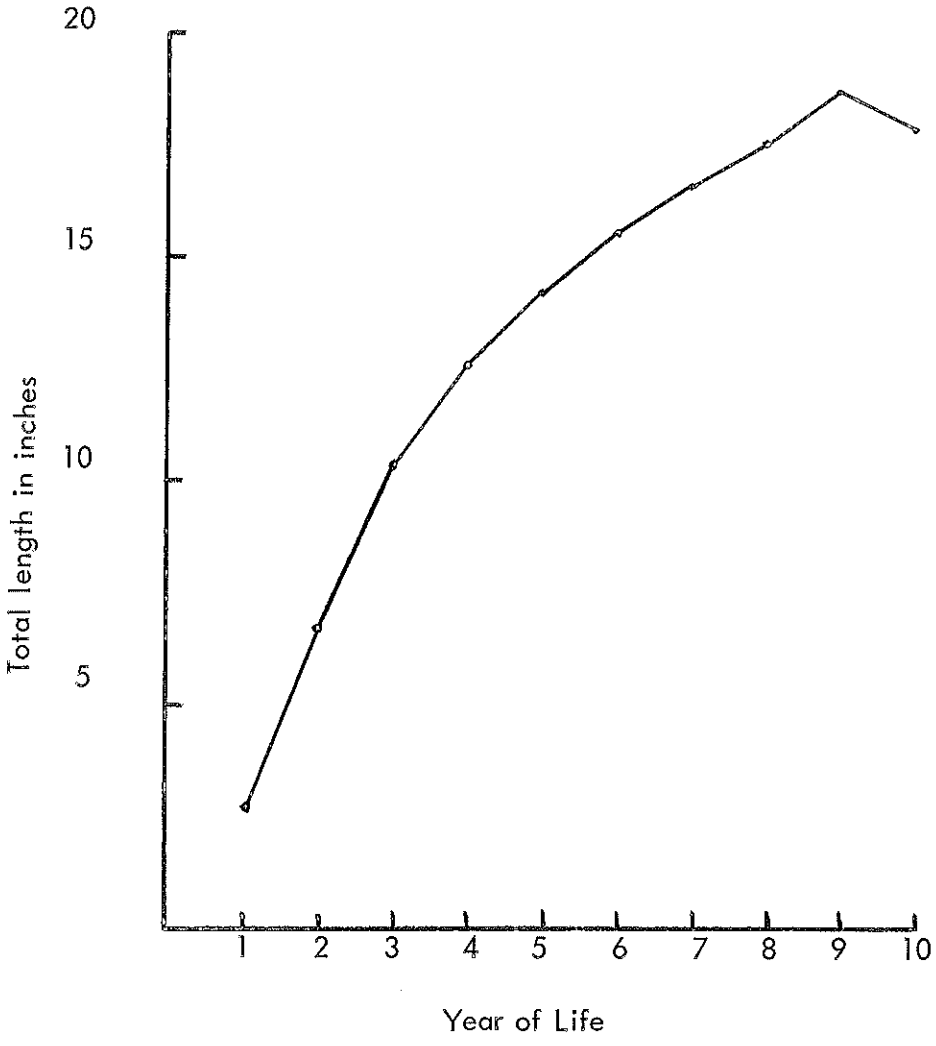

Figure 2. Grand average calculated lengths of carpsucker in Coralville Reservoir based on weighted means for 1966 and 1967.

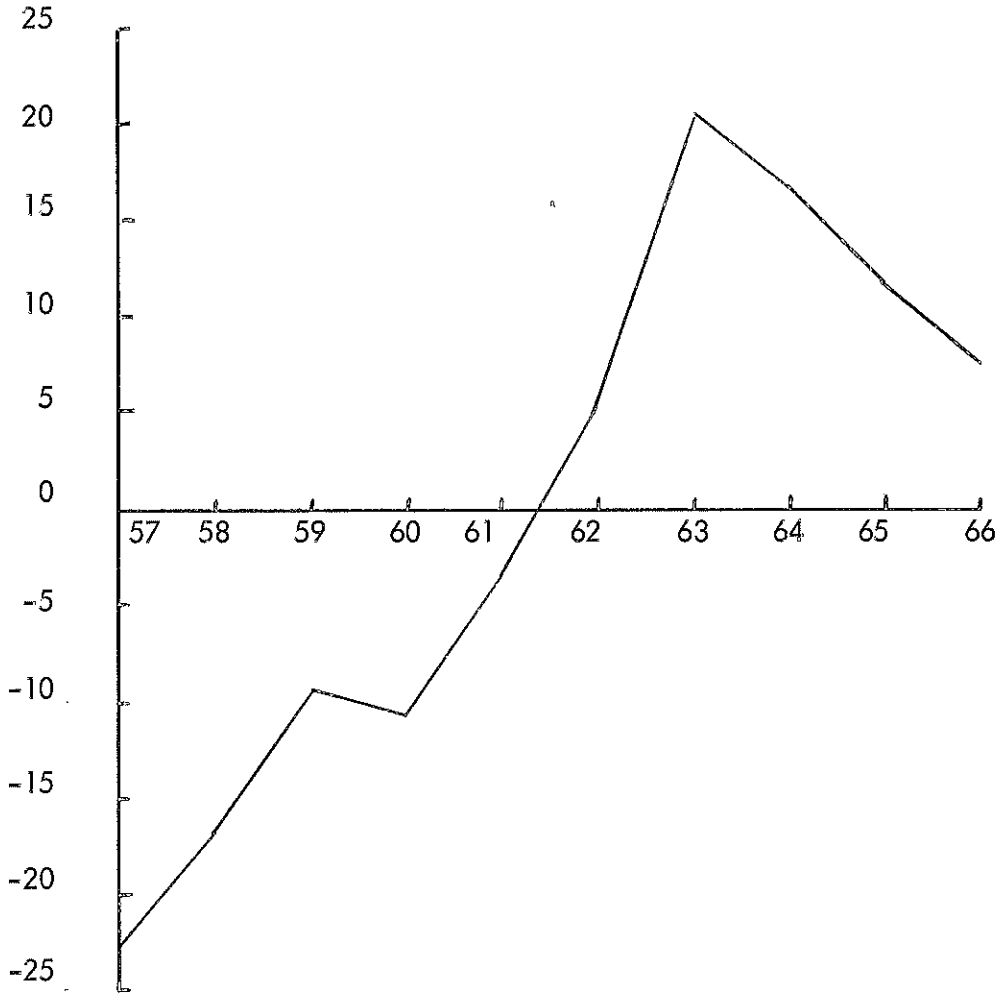

Figure 3. Per cent deviation from mean annual increment for carpsucker in Coralville Reservoir.

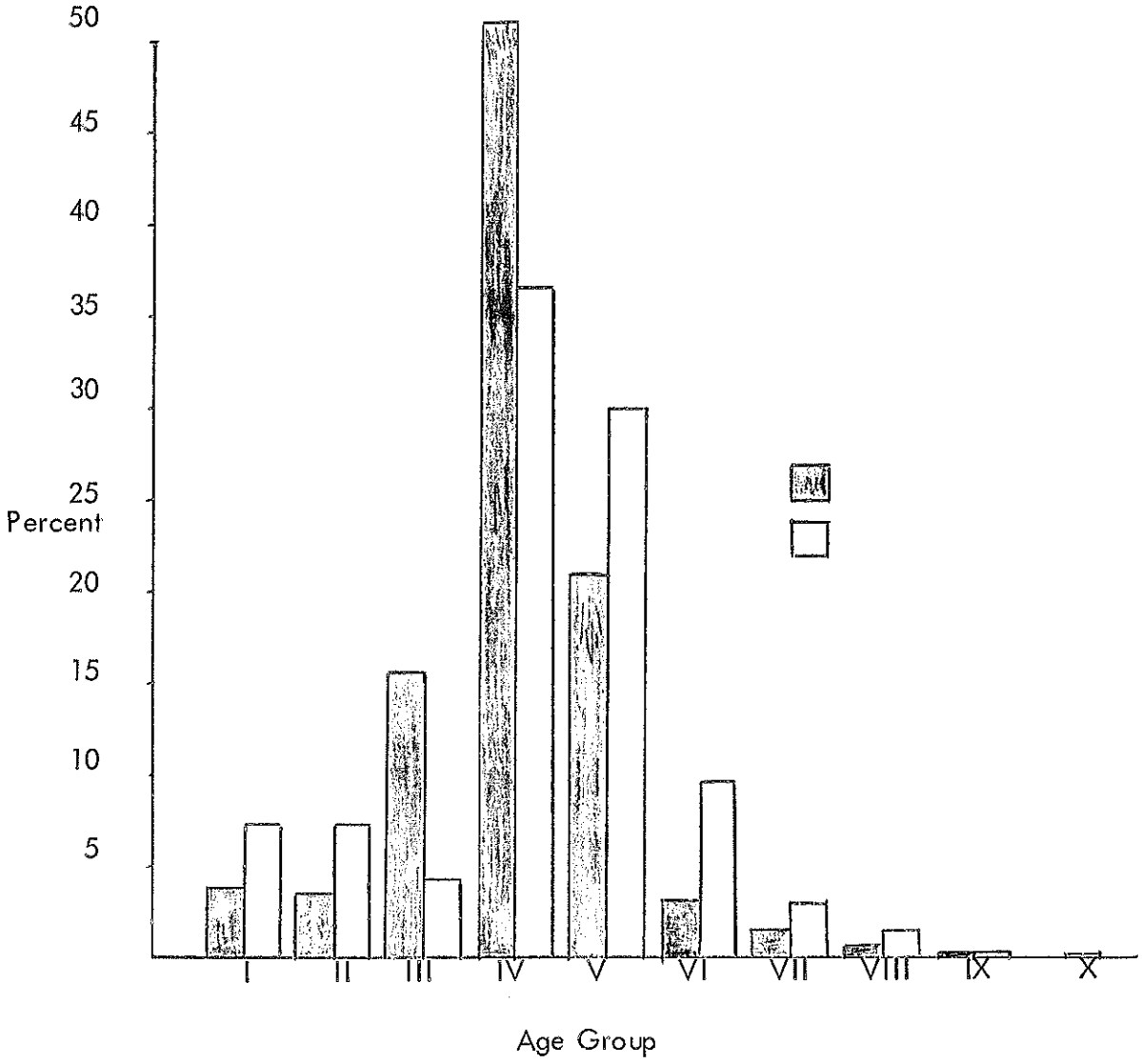

Figure 4. Age distribution of carpsucker in Coralville Reservoir for 1966 and 1967.

Variation in growth for various calendar years was determined by converting growth increments of a given year of life to percentages of mean increments for that year of life. These percentages were averaged for a particular calendar year including all age groups. The ± percent deviation was obtained by subtracting 100 from the resulting value. These values were determined from the weighted means of 1966 and 1967. Best years of growth were 1963.

Table 3 Grand average calculated lengths of carpsucker in Coralville Reservoir based on weighted means for 1966 and 1967

Year	Age	Year of Life									
Class	Group	1	2	3	4	5	6	7	8	9	10
1966	I	3.8									
1965	II	3.5	9.2								
1964	III	2.6	7.6	12.5							
1963	IV	3.1	8.4	12.5	14.7						
1962	V	2.6	8.0	12.1	14.5	15.8					
1961	VI	2.6	6.5	10.4	13.4	15.3	16.6				
1960	VII	2.3	6.2	9.6	12.6	14.5	16.2	17.1			
1959	VIII	2.2	5.5	8.4	10.9	13.5	15.3	16.8	17.9		
1958	IX	2.1	5.6	8.6	10.8	12.8	14.5	16.5	18.1	19.7	
1957	X	1.9	5.1	8.4	10.5	12.4	14.2	15.6	16.7	17.5	17.7
Calc. Length		2.7	6.9	10.3	12.5	14.1	15.4	16.5	17.5	18.6	17.7
Calc. Incrt.		2.7	4.3	3.7	2.5	1.9	1.7	1.5	1.2	1.2	0.2

Age Distribution and Mortality

Mortality rates can be determined from age distribution as described by Ricker (1958). The age distribution for carpsucker in 1966 and 1967 indicate they are not fully vulnerable to fishing gear until in the fourth year of life (Figure 4). Mortality rates were, therefore, calculated for age groups V through X.

The logarithm transformation of particular age group was subtracted from the logarithm of the next older age group and multiplied by -2.3026 (natural logarithm) to give the instantaneous rate of mortality (i) between the two age groups. The annual mortality (a) was determined from a table of exponential functions for the equation $s = e^{-i}$. Data for individual years and combined years was computed in this manner. The average annual mortality rate for 1966 was 0.67, 1967 was 0.65 and combined was 0.66 (Table 4).

A Student t-test was used to test if any statistical difference existed between the calculated mortality rate in 1966 and 1967. The result was not significant (p 0.05). Mortality for 1966 and 1967 was the same.

Catch Success

During 1966 the average catch rate was 0.38 carpsucker per net hour; in 1967 this increased to 0.50. The lowest rate was 0.08 during the July 30 through August 12, 1966 period. Best

success was acheived from March 26 through April 8, 1967, with 1.31 carpsucker per net hour (Table 5).

Analysis of variance was used to determine if the catch success was different due to chance alone. The result was not significant ($p < 0.05$). There was no difference in catch success between the two years, if consideration is given to variation between the two years and within bi-weekly periods.

Discussion

During the summer of 1967, 9,853 pounds of carpsucker were removed from Coralville Reservoir. Concurrently, 20,471 pounds of carp, buffalo and channel catfish were also removed.

Table 5. Catch success of carpsucker in Coralville Reservoir. Success is fish per pound net hour

Period	1966 Success	1967 Success
Mar 26-Ap 8	*	1.31
Ap 9-Ap 22	*	0.88
Ap 23-May 6	*	1.08
May 7-May 20	*	0.56
May 21-June 3	*	1.27
June 4-June 17	0.14	0.24
June 18-July 1	0.50	0.12
July 2-July 15	0.35	*
July 16-July 29	0.82	0.14
July 30-Aug 12	0.08	0.40
Aug 13-Aug 26	0.12	0.28
Aug 27-Sept. 9	0.22	0.57
Sept 10-Sept 23	0.11	*
Sept 24-Oct 7	1.15	*

Parameters such as condition, growth, mortality and catch success were measured to determine if this exploitation effected the remaining population. An increased growth rate, better condition, lower catch success, and higher mortality rate would be expected to occur if substantial numbers of fish were harvested. No difference in these vital statistics of the Coralville Reservoir carpsucker population occurred after 30,324 pounds of fish had been removed.

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AGE OF QUAIL TAKEN BY IOWA QUAIL HUNTERS 1967 SEASON

M. E. Stempel
Game Biologist

The Iowa quail wing study began in 1946. It is based on information obtained from wings of quail shot by hunters. Hatching dates of quail under 150 days old are determined during this work; further, it is a means of learning how various weather patterns affected hatching. From it has been learned which age groups are most often taken by hunters, and eventually it should show whether long hunting seasons take excessive numbers of quail that would otherwise live until another production period. These data can be compared to summer whistling quail counts since both studies indicate progress of hatching. The current report is based on results of the 1967 wing survey with supplemental data from roadside and field surveys. Comparisons are made with similar data for 1966.

METHODS

A number of cooperators are contacted each year before the hunting season; these are both Conservation Commission personnel and licensed quail shooters who live in southern Iowa where they can collect large numbers of wings. Procedures are further discussed in the Quarterly Biology Reports for October - December 1965.

RESULTS

A total of 1,248 wings was collected in October and early November of 1967. These were from 19 counties and the number was more than enough to establish production periods of the young (Haugen 1958). Eighty-one percent were from young birds; the comparable figure was 86 percent in 1966. There were 100 hens per 100 cocks in the sample. Other information is presented in Tables 1 and 2.

Most of the 1967 wing collection was made before November 15; whereas the open season dates were October 21 to January 28, 1968. In 1966 the corresponding collection of wings was made primarily in October.

While hunters took the most birds from the more numerous young segment, the true proportion in the field may not be represented. The quail wing sample which is obtained from hunters must be regarded as a sample of the most available birds which are large enough to be acceptable to hunters, since some do not shoot the "squealers" or very small young quail. Opportunity to kill quail is influenced by many factors. As an example, any quail, adult or young, which have fully developed flight plumage, and are thus capable of strong flight, are less liable to be shot than mature-appearing quail with short or immature flight feathers. Hence it is possible that the kill of the strong flying quail would be less than that of the weaker flyers, even though the better developed birds (either young or old) might be more numerous than is shown in the kill.

Quail Hatching Distribution in 1967

Seventy percent of the wings of quail taken early in the season were from quail under 150 days old, and the approximate age of these could be determined by growth stage of primaries. For this segment the hatch began in June, peaked in July, remained high into August, then tapered off and ended in October (Figure 1). The graph represents mostly birds shot in October, since as the season progressed a higher percentage exceeded 150 days age.

Adults

About 20 percent of the total take was adult quail (over one year old). They moult all 10 of the wing primaries while the young usually shed only the inner 8 flight feathers. None of the adults had moulted completely; i.e., the primaries were not all replaced with new feathers.

Supplementary Data from Broods Sighted in the Summer

No exact hatching date can be assigned to young quail over 150 days old because flight feather growth is completed and all primaries are full length. However, we have information on the age of 38 broods sighted during summer. I observed some of these, while others were reported by officers, biologists, farmers and dog trainers. These began to hatch in late May. The broods seen were hatched in May (2) June (19) July (13) and August (4).

DISCUSSION

About 75 percent of the birds under 150 days old were nearing maturity when taken by gunners. The number of other young quail (over 150 days old) represent a good early hatch. Many adults were still in early moult when shot, and this indicated that there was good late production as well as early production, since moult follows nesting activity. Altogether, after an early start, a high rate of hatch was soon reached and good success was maintained, with a resulting high fall population.

The 1967 production pattern was estimated from the collection of 1,216 wings from 19 counties in southern Iowa quail range. Seventy percent were young (under 150 days old) that could be aged. Their hatching dates were established. Thirteen percent of young (over 150 days old) had fully matured flight feathers. None of the adults collected in October bore fully matured wing plumage. Additional information was gleaned from observation of 38 broods in the summer.

In 1966 good production was indicated by comparable data from 1,060 wings. Twenty-one counties were represented. Seventy-four percent of the young (under 150 days old) could be aged and their hatching dates established. No adults bore fully matured flight feathers. Additional information came from 42 coveys sighted in the summer of 1966.

The 1967-68 quail shooting began October 21; the 1966 season began October 22. Early seasons are of considerable help in getting better production information from a sample of birds harvested.

LITERATURE CITED

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1958. Progress report on Alabama bobwhite quail wing study. Proc. Twelfth Ann. Conf. S. W. Assoc. of Game and Fish Commissioners.

Table 1. A tabular compilation of data from Iowa quail wings collected in 1966 and 1967

	1967	1966
1. No. of wings	1,248	1,436
2. No. of wings accompanied by useable information	1,216	1,436
3. No. of counties represented	19	21
4. Percent of young in sample	81	86
5. Percent of young that were mature or nearly so (90 days old or older)	75*	67**

* Birds taken October 21 to November 29
** Birds taken October 22 to November 12

Table 2. The percent young in quail bagged in Iowa 1956-67

Year	% young in quail bagged	No. of wings in sample*
1956	87	352
1957	87	613
1958	80	1,253
1959	85	939
1960	90	656
1961	89	560
1962	88	576
1963	89	1,380
1964	86	1,639
1965	85	1,364
1966	86	1,436
1967	81	1,248

* Some wings are not included as they were not accompanied by data on place and date of kill; some wings decayed because they were sealed in plastic bags or other air-tight containers.

Wings from more than 1,248 quail shot by Iowa quail hunters during the 1967-68 season were collected from 19 counties in late October and early Nobember. Eighty-one percent were juveniles. The hatch, as determined from wings and from coveys seen in the summer, began in May, peaked in June, and remained high into August. Altogether, after an early start a high rate of hatch was soon reached; it was maintained over a long period, with a population similar to that of the previous year.

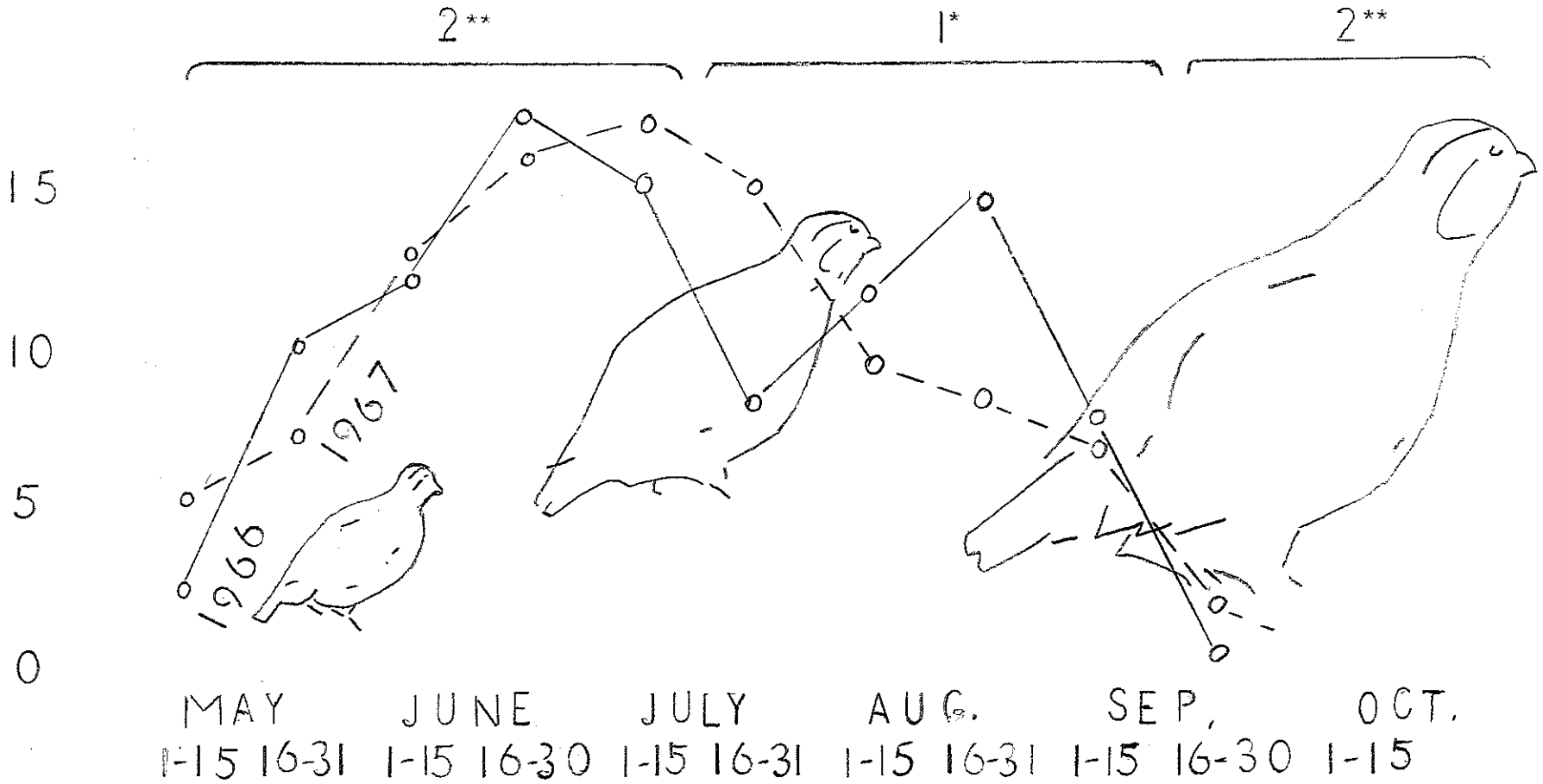

Figure 1. Comparison of 1967 and 1966 quail hatching date distribution

*1. Data from ageable wings taken through early November.

**2. Based on wing samples, broods seen and aged, research area call counts and other calling quail counts; few wings can be aged from birds hatched prior to July when the season opens in November. In 1967 and 1966 the season opened October 21 and 22 respectively and wings could be aged back to early July and late June.

RESULTS OF THE 1967 SHOTGUN DEER SEASON

Paul D. Kline
Game Biologist

INTRODUCTION

Modern deer hunting in Iowa dates back to 1953 when hunting was permitted for five days in 45 counties (Sanderson and Speaker, 1954). During 1954, hunting was permitted in 51½ counties for three days (Kline, 1965). Since 1954 annual seasons of two to four days duration have been held on a statewide basis. Deer of either sex and all ages have been legal game during all seasons.

Through years 1963-66 the state was divided into two zones with fewer days of hunting permitted in the north-central zone than elsewhere in the state. These regulations have been enforced in response to known vulnerability of deer because of less protective habitat in parts of north and central Iowa.

For the 1967 season the state was divided into six zones and maximum numbers of licenses issued for each zone were established. These license quotas and the Zones appear in Figure 1. Landowners and tenants were required for the first time since 1954 to have a license. However, the landowners and tenants were issued licenses free of charge and without restriction of zonal quotas.

METHODS

Each hunter, whether or not he hunted or was successful, was required to return a card to the Conservation Commission recording the various aspects of his hunting effort and success. These cards were coded by Commission personnel and submitted to Data Processing Division of the Comptroller's office where they were subjected to computer analysis. The information submitted in this report was derived from the above source.

The data was treated separately from the purchased licenses and from the licenses issued free. Hereinafter these are referred to as "paid shotgun" and "landowner-tenant" hunters or licenses.

RESULTS

Card Returns

In all, 20,811 paid shotgun and 20,470 landowner-tenant licenses were issued. Of these 96.4 percent of the paid shotgun and 94.9 percent of the landowner-tenants returned report cards (Table 1). Data concerning number of hunters, number of deer killed, and percent success in this report has been corrected to account for those hunters who did not return a report card. This was done by using cards returned too late for computer analysis and expanding the data from them to represent all cards not submitted to Data Processing.

Hunting Success

Significant numbers of licensees did not hunt (Table 1). Of those who did hunt, 7,628 (38.7%) of the paid shotgun hunters and 2,764 (19.0%) of the landowner-tenants bagged a deer. Best hunting success occurred in Zones 1 and 2. Relatively poor success occurred in Zone 4 (Table 2).

Deer were reportedly bagged in every county (Table 3), ranging from three in Grundy and four in Pocahontas counties to over 300 each in Allamakee, Decatur, Guthrie, Harrison, Lucas, Monona, and Monroe counties. Guthrie county produced the largest harvest, 423 deer. Hunting success was significantly low in a number of counties in east-central Iowa - Benton, Buchanan, Cedar, Chickasaw, etc. (Table 3). Landowner-tenants bagged a larger share of the total harvest in Zones 3, 4, and 6 than in the other three Zones (Table 4).

The reported kill of 10,392 (both categories of hunters) was below the 1966 harvest of 10,742. Hunting success by paid shotgun hunters was low in comparison to other years (Table 5). In fact, considering that a three day season was held in a large part of the state, as compared to two day season from 1956 through 1959, it was the lowest recorded.

The harvest by landowner-tenants of 2,764 is significantly higher than the estimates for 1966 (1,672) and 1965 (1,322). This leads me to suspect that we may have been underestimating the harvest by landowner-tenants in past years by as much as 65 percent. The basic assumption is, of course, that the proportion of landowner-tenants to paid shotgun hunters remained constant through years 1965-67.

In Zones 1-3 combined, more deer were harvested during the second day than during the first (Table 6). The bag did fall somewhat during the third day but still amounted to 27.3 percent of the total harvest. Obviously it should drop on the third day as those hunters who had bagged a deer during the first two days were out of circulation as far as adding to their own bag; although admittedly they may have been helping one or more partners to bag deer. More deer were bagged on the second day in Zones 4-6 also.

Paid shotgun hunters were slightly more successful in the mornings than during the afternoons (Table 7). Landowner-tenants were significantly more successful in the morning. In the latter case I suspect that landowner-tenants spent considerable more time afield in the mornings than they did in the afternoons.

Hunting Effort

Paid shotgun hunters saw 125,996 deer during 295,728 hours of hunting. This does not mean that these were all different individual deer. Doubtlessly, in many instances the same deer were seen by a number of different hunters, or even several times by an individual hunter. This amounts to 15.0 hours per average hunter during which time he saw 6.4 deer (6.2 in 1966) or 0.43 deer per hour of hunting (Table 8). For every deer killed 38.8 hours of hunting effort were required. Fewer deer were seen per hour in Zone 4 than in any other Zone. More were seen per hour in Zone 1 than in all other Zones.

One significant fact emerges in Table 8: The number of hours expended per hunter for Zones 4-6 (2 day season) as compared to Zones 1-3 (3 day season) are very nearly the same. In other words, the effort reported by hunters measured in total hours differed little between two and three day zones.

Landowner-tenants saw 38,598 deer during 122,907 hours of hunting. This amounts to 8.5 hours per average hunter during which time he saw 2.7 deer or 0.31 deer per hour of hunting (Table 9). For every deer killed by landowner-tenants 44.5 hours of hunting effort were required. Here again, more deer were seen per hour in Zone 1 than in other zones; fewest were seen in Zone 4.

Paid shotgun licensees hunted in much larger parties (average 6.3) than did the landowner-tenants (average 2.6). This is to be expected, and may partially acount for the relatively low success of landowner-tenants.

Farmers comprised 26.4 percent of the paid shotgun licensees. This was a total of 5,196 as compared to 5,750 in 1966 and 6,146 in 1965. Perhaps increasing numbers of farmers are utilizing their prerogative to hunt without charge on their properties.

Of the paid shotgun hunters, 57.3 percent hunted in their home counties as compared to 93.9 percent of landowner-tenants (Table 10). This difference is to be expected because many of the landowner-tenants live "on the land" and would have no reason or right to hunt in other than their home counties.

Crippling Loss

Hunters reportedly crippled a total of 2,664 deer. Including both categories of hunters, 1 deer was crippled for every 12.9 hunters afield, and for every 3.9 deer bagged. Landowner-tenants crippled fewer per hunter than did the paid shotgun hunters (Table 11).

Experience of past seasons has taught us that crippling loss in Iowa is not a serious factor affecting the deer herd. Apparently most cripples are bagged during the season by hunters other than those who inflict the original wounds. Hence, they are reported by one hunter as a cripple, and by another as a deer bagged. I cannot believe that the real crippling loss is anywhere near that suggested in Table 11.

Biological Data

Of all deer reported, 22.4 percent were fawns and 53.7 percent were males (Table 12). On the basis of data gathered in the past by Conservation Commission technicians there can be no doubt that the percentage of fawns reported by hunters is well below the actual occurrence. Hunters, approximately half the time, cannot tell a fawn from an adult deer. Or they may be reluctant to admit having shot fawns so instead report having bagged adult deer.

DISCUSSION

Disregarding administrative, law enforcement, or other interests, the requirement in 1967 that landowner-tenants have a license and return a report card was certainly valuable from a biological viewpoint. For the first time in recent years we have a really accurate accounting of the impact on the herd of hunting by landowner-tenants. We learned that they probably harvest more deer than previously suspected. We were astonished to learn that over 20,000 hunters applied for these free licenses. For the first time we know how many landowner-tenants participate in deer hunting.

However, we also learned that the landowner-tenants do not take their hunting nearly as seriously as do other hunters. Almost 6,000 of the free licensees did not hunt. Those who did spent much less time hunting, and were not nearly as apt to bag a deer as were the paid shotgun hunters.

The low success reported both by paid shotgun and landowner-tenant hunters in Zone 4 may reflect reduced deer populations in that part of Iowa. If so, it may indicate that we have overharvested there in the past and should take measures to remedy the situation.

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Table 1. Licenses issued and report cards returned

	Paid shotgun	Landowner-Tenant	Totals
Number licenses issued	20,811	20,470	41,281
Number of hunters*	19,712	14,529	34,241
Number who did not hunt*	1,099	5,941	7,040
Percent of licensees who hunted	94.7	71.0	82.9
Number report cards returned	20,064	19,433	39,497
Percent of cards returned	96.4	94.9	95.7

* These data have been corrected to account for licensees who did not return cards.

Table 2. Hunting success by zones

Zone No.	Paid Shotgun			Landowner-Tenant			Combined		
	Number Hunters	Reported Harvest	Percent Success	Number Hunters	Reported Harvest	Percent Success	Number Hunters	Reported Harvest	Percent Success
1	4,083	1,674	41.0	1,791	411	22.9	5,874	2,085	35.5
2	3,788	1,705	45.0	2,928	634	21.7	6,716	2,339	34.8
3	5,209	2,071	39.8	4,060	827	20.4	9,269	2,898	31.3
4	2,367	539	22.8	1,893	232	12.3	4,260	771	18.1
5	2,367	701	29.6	1,504	212	12.3	3,871	913	23.6
6	1,894	768	40.5	1,696	320	18.7	3,590	1,088	30.3
State-wide*	19,712	7,628	38.7	14,529	2,764	19.0	34,241	10,392	30.3

* Statewide data have been corrected for non-reporting hunters. Therefore, the columns will not necessarily total to the statewide data.

Table 3. Comparisons of hunting success by counties

County	Paid Shotgun			Landowner-Tenant			Total Harvest
	Number Hunters	Reported Harvest	Percent Success	Number Hunters	Reported Harvest	Percent Success	
Adair	297	105	35.4	134	31	23.1	136
Adams	177	79	44.6	122	24	19.7	103
Allamakee	898	245	27.3	528	109	20.6	354
Appanoose	274	100	36.5	300	46	15.3	146
Audubon	149	55	36.9	113	24	21.2	79
Benton	138	13	9.4	69	4	5.8	17
Black Hawk	100	17	17.0	85	0	0.0	17
Boone	249	88	35.3	160	47	29.4	135
Bremer	142	32	22.5	78	6	7.7	38
Buchanan	122	15	12.3	54	2	3.7	17
Buena Vista	44	20	45.5	50	6	12.0	26
Butler	132	44	33.3	80	23	28.8	67
Calhoun	21	7	33.3	17	0	0.0	7
Carroll	73	25	34.2	47	5	10.6	30
Cass	241	101	41.9	180	25	13.9	126
Cedar	96	19	19.8	32	0	0.0	19
Cerro Gordo	54	22	40.7	33	8	24.2	30
Cherokee	201	62	30.8	112	25	22.3	87
Chickasaw	105	14	13.3	67	7	10.4	21
Clarke	245	94	38.4	184	46	25.0	140
Clay	149	54	36.2	130	31	23.8	85
Clayton	645	172	26.7	391	54	13.8	226
Clinton	183	42	23.0	124	15	12.1	57
Crawford	394	139	35.3	130	23	17.7	162
Dallas	482	161	33.4	214	37	17.3	198
Davis	222	99	44.6	192	46	24.0	145
Decatur	448	188	42.0	371	127	34.2	315
Delaware	173	31	17.9	80	7	8.8	38
Des Moines	512	206	40.2	164	25	15.2	231
Dickinson	69	31	44.9	56	9	16.1	40
Dubuque	156	31	19.9	88	6	6.8	37
Emmett	91	32	35.2	98	20	20.4	52
Fayette	315	90	28.6	186	21	11.3	111
Floyd	148	36	24.3	90	10	11.1	46
Franklin	47	15	31.9	41	5	12.2	20
Fremont	163	72	44.2	157	36	22.9	108

Table 3. Continued

County	Paid Shotgun			Landowner-Tenant			Total Harvest
	Number Hunters	Reported Harvest	Percent Success	Number Hunters	Reported Harvest	Percent Success	
Greene	152	56	36.8	101	25	24.8	81
Grundy	6	3	50.0	7	0	0.0	3
Guthrie	757	327	43.2	375	96	25.6	423
Hamilton	101	31	30.7	91	11	12.1	42
Hancock	41	8	19.5	36	6	16.7	14
Hardin	80	14	17.5	75	11	14.7	25
Harrison	638	248	38.9	214	60	28.0	308
Henry	237	70	29.5	189	34	18.0	104
Howard	125	35	28.0	61	6	9.8	41
Humboldt	51	25	49.0	39	9	23.1	34
Ida	46	15	32.6	12	3	25.0	18
Iowa	147	41	27.9	108	16	14.8	57
Jackson	387	108	27.9	179	32	17.9	140
Jasper	80	16	20.0	143	17	11.9	33
Jefferson	163	50	30.7	132	21	15.9	71
Johnson	200	26	13.0	111	8	7.2	34
Jones	222	42	18.9	126	11	8.7	53
Keokuk	211	49	23.2	149	23	15.4	72
Kossuth	125	49	39.2	109	23	21.1	72
Lee	416	140	33.7	310	64	20.6	204
Linn	303	44	14.5	114	4	3.5	48
Louisa	216	71	32.9	108	24	22.2	95
Lucas	714	276	38.7	403	96	23.8	372
Lyon	192	72	37.5	66	10	15.2	82
Madison	558	199	35.7	421	94	22.3	293
Mahaska	178	54	30.3	149	34	22.8	88
Marion	454	169	37.2	260	43	16.5	212
Marshall	74	30	40.5	41	5	12.2	35
Mills	217	70	32.3	117	18	15.4	88
Mitchell	94	31	33.0	51	10	19.6	41
Monona	535	248	46.4	184	57	31.0	305
Monroe	670	217	32.4	430	109	25.3	326
Montgomery	160	66	41.3	85	22	25.9	88
Muscatine	72	14	19.4	93	19	20.4	33
O'Brien	86	40	46.5	55	20	36.4	60
Osceola	32	19	59.4	16	1	6.3	20
Page	156	51	32.7	129	18	14.0	69
Palo Alto	78	15	19.2	88	18	20.5	33

Table 3. Continued

County	Paid Shotgun			Landowner-Tenant			Total Harvest
	Number Hunters	Reported Harvest	Percent Success	Number Hunters	Reported Harvest	Percent Success	
Plymouth	191	57	29.8	74	15	20.3	72
Pocahontas	17	1	5.9	29	3	10.3	4
Polk	214	60	28.0	190	8	4.2	68
Pottawattomie	652	235	36.0	272	55	20.2	290
Poweshiek	42	8	19.0	32	3	9.4	11
Ringgold	181	85	47.0	214	57	26.6	142
Sac	35	12	34.3	47	9	19.1	21
Scott	68	4	5.9	44	3	6.8	7
Shelby	324	181	55.9	107	42	39.3	223
Sioux	126	43	34.1	75	22	29.3	65
Story	33	9	27.3	53	3	5.7	12
Tama	88	32	36.4	80	10	12.5	42
Taylor	126	58	46.0	162	28	17.3	86
Union	273	135	49.5	195	36	18.5	171
Van Buren	328	133	40.5	252	58	23.1	191
Wapello	297	77	25.9	262	44	16.8	121
Warren	506	185	36.6	394	66	16.8	251
Washington	231	56	24.2	175	36	20.6	92
Wayne	186	48	25.8	156	38	24.4	86
Webster	95	35	36.8	98	32	32.7	67
Winnebago	97	35	36.1	48	4	8.3	39
Winneshiek	509	146	28.7	310	25	8.1	171
Woodbury	605	178	29.4	174	38	21.8	216
Worth	86	38	44.2	42	5	11.9	43
Wright	58	12	20.7	53	8	15.1	20
Totals	22,297*	7,458	33.4	13,872	2,636	19.0	10,094**

* Some hunters hunted in two or more counties.

** Not corrected for non-reporting hunters.

Table 4. A comparison of harvest by paid shotgun hunters and landowner-tenants by zones

Zone	Reported harvest		Percent harvest by paid shotgun
	Paid shotgun	Landowner-Tenant	
1	1,674	411	80.3
2	1,705	634	72.9
3	2,071	827	71.5
4	539	232	69.9
5	701	212	76.8
6	768	320	70.6
Statewide	7,628	2,764	73.4

* Corrected for non-reporting hunters.

Table 5. Comparison of statewide success with past seasons

Year	Season Length in Days	Paid Licenses Issued	Number Deer Killed	Number Killed by Landowner-Tenants	Total Gun Harvest	Percent Success*
1953	5	3,772	2,401	1,595	3,996	61.1
1954	3	3,788	2,414	---	2,414	63.7
1955	3	5,586	2,438	568	3,006	43.6
1956	2	5,440	1,990	561	2,551	39.2
1957	2	5,942	2,171	480	2,651	36.8
1958	2	6,000	2,115	588	2,703	38.4
1959	2	6,000	1,935	541	2,476	33.1
1960	3	7,000	3,248	814	4,062	45.9
1961	3	8,000	4,032	964	4,996	51.6
1962	3	10,000	4,281	1,018	5,299	43.5
1963	2,3	12,001	5,595	1,017	6,612	48.0
1964	2,4	15,993	7,274	1,750	9,024	47.1
1965	2,4	17,491	6,588	1,322	7,910	39.3
1966	2,4	20,841	9,070	1,672	10,742	45.2
1967	2,3	20,811	7,628	2,764	10,392	38.7

* Based on paid shotgun hunters only.

Table 6. A comparison of harvest each day for two and three day zones; all licensees

Zones	1 st Day		2nd Day		3rd Day	
	Number Harvested	Percent of Total	Number Harvested	Percent of Total	Number Harvested	Percent of Total
1-3 combined	2,471	33.7	2,856	40.0	2,001	27.3
4-6 combined	1,305	47.2	1,461	52.8	------	----
Statewide	3,776	37.4	4,317	42.8	2,001	19.8

Table 7. Comparison of morning and afternoon hunting success

	Number killed morning	Percent	Number killed afternoon	Percent
Paid shotgun	3,737	50.1	3,721	49.9
Landowner-Tenant	1,513	57.4	1,123	42.6
Combined Totals	5,250	52.0	4,844	48.0

Table 8. Hours hunted and deer seen by paid shotgun hunters

Zone	Number Hunters	Number Hours Hunted	Number Deer Seen	Deer per Hunter	Deer per Hour	Hours per Hunter	Hours per Deer Killed
1	3,947	56,371	31,123	7.9	0.55	14.3	34.8
2	3,662	60,990	28,472	7.7	0.47	16.6	37.0
3	5,036	76,492	32,894	6.5	0.43	15.2	38.2
4	2,288	35,306	8,134	3.6	0.23	15.4	67.7
5	2,288	30,943	9,922	4.3	0.32	13.5	45.6
6	1,831	25,984	11,343	6.2	0.44	14.2	35.0
State*	19,712	295,728	125,996	6.4	0.43	15.0	38.8

* Statewide data is corrected for non-reporting hunters.

Table 9. Hours hunted and deer seen by landowner-tenants

Zone	Number Hunters	Number Hours Hunted	Number Deer seen	Deer per Hunter	Deer per Hour	Hours per Hunter	Hours per Deer Killed
1	1,791	15,151	6,573	3.7	0.43	8.5	36.9
2	2,928	26,181	9,889	3.4	0.38	8.9	41.3
3	4,060	35,312	10,620	2.6	0.30	8.7	42.7
4	1,893	15,316	2,747	1.5	0.18	8.1	66.0
5	1,504	12,361	2,712	1.8	0.22	8.2	58.3
6	1,696	13,035	4,314	2.5	0.33	7.7	40.7
State*	14,529	122,907	38,598	2.7	0.31	8.5	44.5

* Statewide data is corrected for non-reporting hunters.

Table 10. Dispersal of hunters

	Hunting in Home County only		Hunting in Home County Plus Other Counties		Hunting Outside Home County	
	Number	Percent	Number	Percent	Number	Percent
Paid Shotgun	8,758	46.0	2,150	11.3	8,146	42.7
Landowner-Tenant	12,722	91.7	300	2.2	850	6.1
Combined Totals	21,480	65.2	2,450	7.4	8,996	27.4

Table 11. Crippling loss reported by hunters*

	Number Hunters Crippling deer	Number deer Crippled	Hunters per Deer crippled	Number deer Killed per One crippled
Paid shotgun	1,611	2,105	9.4	3.6
Landowner-tenant	462	559	26.0	4.9
Totals	2,073	2,664	12.9	3.9

* Corrected for non-reporting hunters.

Table 12. Age and sex of deer reported by hunters

	Age			Sex		
	Total	Number Fawns	Percent Fawns	Total	Number Males	Percent Males
Paid Shotgun	7,458	1,697	22.8	7,485	3,998	53.6
Landowner-Tenant	2,636	563	21.4	2,636	1,421	53.9
Combined Totals	10,094	2,260	22.4	10,094	5,419	53.7

RESULTS OF THE 1967 PHEASANT HUNTER SURVEY

Richard C. Nomsen
Game Biologist

A random sample consisting of 5,000 names was drawn from the duplicate files of license sales following the 1967 season. Names were selected from each county according to the number of hunting and combination hunting-fishing licenses sold. This total also includes 150 names drawn from the duplicate files of non-resident hunting license sales. A record card and letter of instructions were mailed to each person selected requesting information about the previous hunting season.

The 52-day season opened on November 11 and closed January 1, 1968, with shooting permitted from 8:00 a.m. to 4:30 p.m.. The daily bag limit was 3 cocks and the possession limit was 6 roosters.

A total of 2,024 cards was received from resident hunters, which was 41 per cent of the sample mailed. There were 79 returns from non-resident hunters. Total license sales for 1967 consisted of 169,100 hunting and 125,600 combination. Non-resident license sales also increased from 9,200 in 1966 to 11,200 in 1967. Total license sales increased 5 per cent from the previous year.

Results of the survey indicated that hunter success in 1967 was somewhat below normal. Complete statewide statistics are given in Table 1 for both resident and non-resident hunters. These figures include only licensed hunters - no figures are available for persons hunting on their own land without a license, or those under 16 hunting with a licensed adult. It is believed that their omission would tend to balance any bias in the data obtained due to non-response and the possibility that hunting results were poorer for those that did not respond.

The total kill of cocks during the 1967 season was 1,212,200 which was 16 per cent below the harvest in 1966. The 1967 August roadside count had indicated a 14 per cent decrease in the fall population. Hunting conditions were very unfavorable as the season opened - less than half of Iowa's corn had been harvested because of wet fields and high moisture grain.

The survey showed that there was a slight increase in the number of hunters this year, but the number of hunting trips remained essentially the same (Table 2). Resident hunters averaged one bird less for the season and non-resident hunters averaged 7.4 birds compared to 9.2 roosters for the 1966 season. Much more time was needed to bag each rooster in 1967 because of the difficult hunting conditions. Resident hunters averaged one bird every 4.6 hours of hunting while non-residents worked 3.9 hours for each rooster.

Central Iowa again supported the greatest hunting pressure and rooster harvest. A noticeable decrease in hunting pressure was recorded for the Southwest Region - and a corresponding decrease in the kill. The estimated total harvest increased in Southeast Iowa as all other regions reported a lower harvest. Results of the August roadside count in 1967 indicated a slight population increase in the Southeast part of Iowa's pheasant range.

HUNS

Huns were reported shot in 14 Northwest Iowa counties. A total of 75 huns were reported killed by 28 hunters. Estimates from these limited samples indicated that 11,300 hungarian partridge were harvested in 1967 compared to 12,000 in 1966. Best hunting was reported from Sioux county where 5 of 20 hunters reported shooting huns.

Table 1. Statewide pheasant hunting statistics from the 1967 postal card survey

	Resident	Non-Resident
Statewide Bag - Pheasants	1,134,100	78,100
Total Hunting Hours	5,224,000	302,200
Total Hunting Trips	1,267,400	54,600
Number Hunting Pheasants	233,800	10,500
Per Cent Hunting Pheasants	79.0%	93.7%
Avg. No. Trips per Hunter	5.42	5.18
Avg. No. Gun Hours per Hunter	22.34	28.69
Avg. No. Bagged per Hunter per Season	4.85	7.41
Avg. No. Bagged per Trip	0.89	1.43
Avg. No. Bagged per Gun Hour	0.22	0.26
Avg. No. Hours per Bird	4.60	3.88
Avg. No. Hours per Trip	4.12	5.54

Table 2. Summary of statewide hunting success Iowa, 1966 and 1967

	1966	1967
Resident Hunters		
Per Cent of Licensees Hunting Pheasants	82.5	79.0
Avg. No. of Hunting Trips	5.5	5.4
Avg. Season Kill per hunter	5.9	4.9
Hours per Pheasant Killed	3.6	4.6
Estimated Total No. of Pheasant Hunters	231,800	233,800
Estimated Total No. of Hunting Trips	1,268,000	1,267,400
Estimated Total No. of Pheosants Killed	1,370,000	1,134,100
Non-Resident Hunters		
Per Cent of Licensees Hunting Pheasants	93.4	93.7
Avg. No. of Hunting Trips	5.5	5.2
Avg. Season Kill per Hunter	9.2	7.4
Hours per Pheasant Killed	3.0	3.9
Estimated Total No. of Pheasant Hunters	8,600	10,500
Estimated Total No. of Hunting Trips	47,100	54,600
Estimated Total No. of Pheasant Killed	79,400	78,100
Statistics for All Pheasant Hunters		
Estimated Total No. of Pheasants Killed	1,449,400	1,212,200
Estimated Total No. of Pheasant Hunters	240,400	244,300
Estimated Total No. of Hunting Trips	1,315,100	1,322,000
Estimated Total No. of Hunting Hours	5,128,500	5,526,200

Table 3. Distribution of hunting pressure and pheasant kill by regions, Iowa, 1966 - 1967

Region	Percentage of Trips		Birds Killed	
	1966	1967	1966	1967
1. Northwest	20.3	20.4	239,300	198,600
2. North Central	16.6	18.3	246,400	198,400
3. Southwest	16.0	13.3	257,200	163,300
4. Central	21.2	22.8	282,700	260,800
5. East	19.0	17.3	255,900	207,500
6. South	6.9	7.9	88,500	105,500

RESULTS OF FORNEY LAKE CONTROLLED GOOSE HUNTING 1966 & 1967

Richard Bishop
Game Biologist

Ron Andrews
Game Biologist

Controlled goose hunting regulations were established in 1966 on Forney Lake, a state game management area in Fremont County in southwest Iowa.

Twenty-five blinds were constructed on the north and west sides of Forney Lake prior to the hunting season. Blind reservations were accepted in the Des Moines office of the Conservation Commission from the announcement of the waterfowl season until September 15. After September 15 reservations could be made at Forney Lake. Reservations were issued on a first come - first serve basis. Reservations had to be accompanied by a certified check, bank draft, or postal money order in the amount of five dollars in 1966 or one dollar in 1967. Blind fees were five dollars a blind in 1966 and one dollor per blind plus a dollar for each hunter in 1967. Individuals holding reservations had to be present at Forney Lake headquarters one hour before legal shooting time on the day of their reservation. Blind sites were alloted by a drawing. Parties could hunt only from assigned blinds unless the party checked back into headquarters and paid additional blind fee for an unoccupied blind.

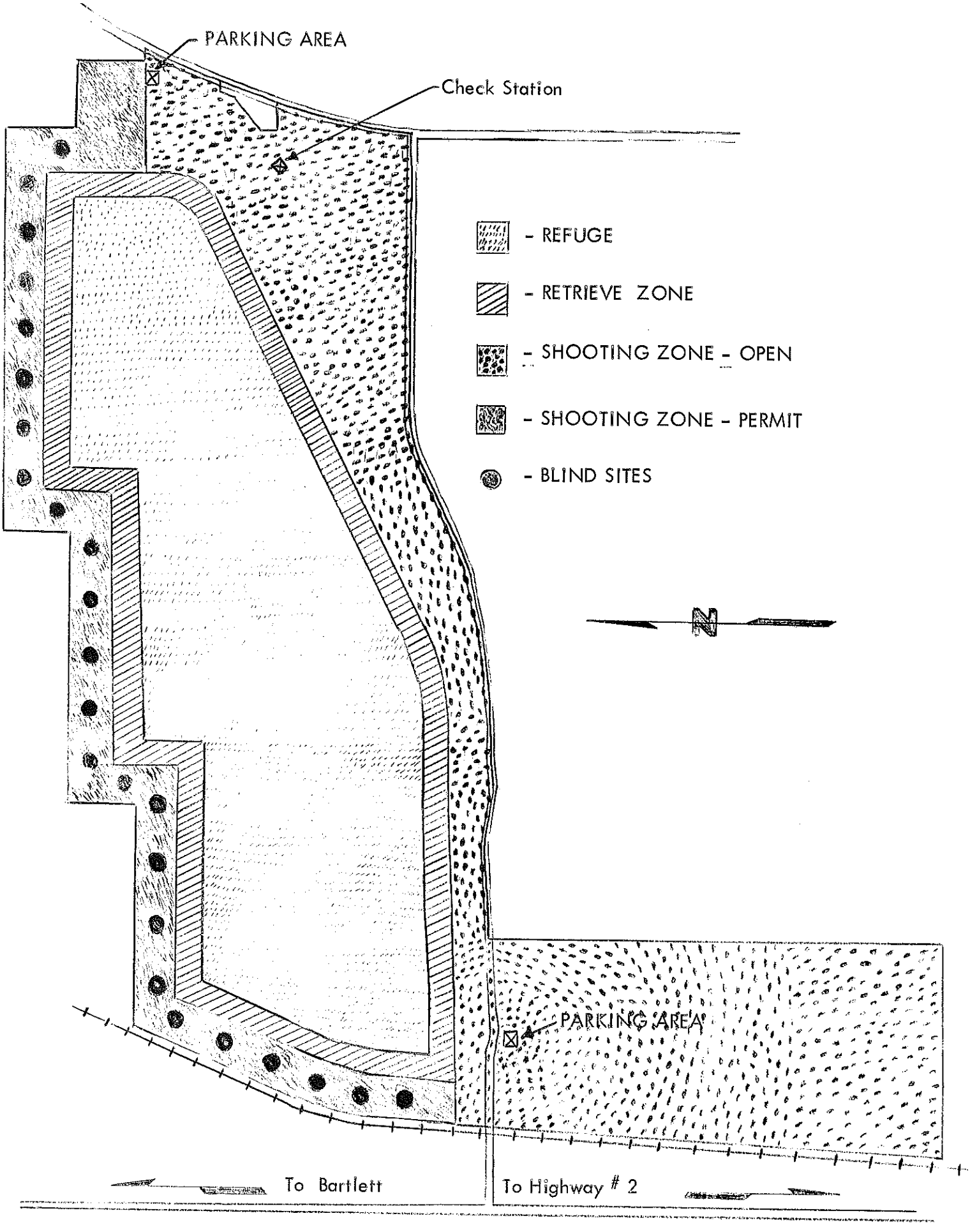
Not more than three hunters were allowed in a blind and the hunters had to remain in the blinds except for retrieving birds. All hunters were required to leave their hunting licenses at the check station in exchange for the blind permit. The hunters were then required to return to the checking station to reclaim their hunting licenses and fill out a data card on their hunting activity.

Controlled hunting was confined to the north and west sides of Forney Lake while the south and east sides were open to public shooting. A map of the area is included (Fig. 1).

RESULTS

In 1966. 1,109 hunters spent 8,254 hours hunting and shot 802 geese in the controlled area. In 1967. 2,073 hunters hunted 12,995 hours, shot 16,838 shells, crippled 403 geese and bagged 554 geese. Table 1 shows comparative figures for 1966 and 1967. Table 2 gives the chronology of hunting activity during the season. Table 3 gives sex and age data of geese checked. Of the geese checked in 1967 219 were blues, 308 snows, 6 whitefronts, 5 Canadas, and 10 Hutchinson geese. Sex and age data indicates in 1967, 129 adult blues and 86 immature blues were killed and 196 adults and 108 immature snow geese were killed. This compares to 114 adult blues and 159 immature blue geese and 180 adult snows and 323 immature snow geese taken in 1966.

Age ratios varied quite noticeably from 1966 to 1967, being 1.64 immatures per adult in 1966 to .60 immatures per adult in 1967. The percent of blues was 35% in 1966 and 41 % blues in 1967.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- BLIND SITES
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PARKING AREA
To Bartlett
To Highway # 2

Hunters spent 10.3 hours to bag a goose in 1966 and 23.5 hours to bag one goose in 1967. Kill figures per hunter indicated 0.72 geese per hunter in 1966 compared to 0.27 geese per hunter in 1967.

Hunters also bagged a total of 178 ducks and 81 coots. The ducks were of 10 species with mallards making up 77% and pintail 8%. The remaining birds consisted of green-winged teal, gadwall, widgeon, lesser scaup, wood duck, shoveler and blue winged teal.

DISCUSSION

The circumstances that evolved into the controlled hunting set-up at Forney Lake have presented some difficult problems. We are faced with a situation that deals with a lot of hunters on a small area. Shooting pressure is intense during the first half of the goose season and hunting conditions are less than desirable. Early goose migration flights traditionally by pass Iowa and do not stop until they reach northern Missouri. Later flights stop at Forney's and when the shooting pressure slacks off the birds move back into Iowa from Missouri and Forney's reaches its peak concentration. The total kill is governed by migration conditions and weather patterns during the season. When weather conditions are severe with large numbers of birds present, the birds tend to fly lower and are less wary, allowing a much higher kill. Normally most shooting is done in excess of 50 yards and many shots are fired at birds that are at distances greater than 100 yards, which results in a high crippling loss. Hunters on the uncontrolled side of the lake often times argue or fight over fallen birds. In many cases no one knows who killed the bird and the first hunter to the bird claims it. The controlled area does away with this but the high shooting is characteristic of the whole area. We are thus faced with a situation that is not conducive to sportsman-like hunting or proper utilization of the kill.

Data on the controlled area shows a very low ratio of birds bagged per shells shot, but this is easily explained by the long distances of most shooting. The lower kill in 1967 is probably a result of different migration and weather conditions. The significant age ratio differences in the 1966 and 1967 data is likely indicative of lower production in 1967. There is normally a bias toward adult birds but this data alone is not enough for specific conclusions.

Statistics indicate that hunting was relatively poor, showing $23\frac{1}{2}$ hours were spent for each goose bagged. Nevertheless hunters will spend this time and most of them are in favor of this type of hunting. Goose hunting in this area of the state is superior to other areas of the state in number of geese bagged per hour. The pros and cons of this program can be discussed at great length due to the many factors involved. Because of the nature of the situation we prefer not to delay making any conclusions or recommendations until more data is available

Table 1. Forney's lake controlled goose hunt data, 1967 vs. 1966

	1966	1967
No. of Blinds rented	498	953
No. of hunters	1,109	2,073
Gun hours	8,254	12,995
No. of geese killed	802	554
No. of geese crippled	Unknown	403
Ducks killed	78	178
No. of shells shot	Unknown	16,838
Geese bagged per hunter	0.72	0.27
Man hours per goose	10.3	23.5
Geese per blind day	1.6	.58
Cost per goose	$3.10	$4.15

Table 2. Chronology of goose hunting activity, Forney's Lake controlled area, 1967

Date	No. Parties	No. Hunters	No. Hrs. Hunted	No. Shells Shot	No. geese Crippled	No. geese Killed	No. ducks Killed
Sept. 20 - Oct. 6	86	208	1512	1799	81	65	
Oct. 7 - Oct. 13	134	312	2012	1225	32	57	
Oct. 14 - Oct. 20	151	332	2374	1786	47	75	
Oct. 21 - Oct. 27	141	325	1926	2715	70	73	57
Oct. 28 - Nov. 3	86	194	1144	1601	16	37	26
Nov. 4 - Nov. 10	93	202	1123	1976	43	54	28
Nov. 11 - Nov. 17	74	141	816	1281	16	63	15
Nov. 18 - Nov. 24	85	163	1083	2336	47	53	35
Nov. 25 - Dec. 1	51	103	516	1042	22	30	17
Dec. 2 - Dec. 8	52	93	489	1077	29	47	
Totals	953	2,073	12,995	16,838	403	554	178

Table 3. Species, sex and age data of geese killed at Forney's Lake controlled area, 1966-67

	1966	1967
Blue Geese	273	219
Snow Geese	503	308
Canada	7	5
Hutchinson	6	10
Whitefronted	8	6

	AM	AF	IM	IF
1966 Blue Geese	33	26	63	39
1966 Snow Geese	46	61	113	110
1967 Blue Geese	54	71	39	46
1967 Snow Geese	100	93	56	45

OUR PROFESSIONAL RESPONSIBILITY

Richard Bishop
Game Biologist

Looking back on the last century, we can see many instances of man's neglect of the resources he was utilizing. The depletion and in some cases extinction of certain species was not caused altogether by wildlife exploiters, but in many cases was caused by destruction of habitat by those unconcerned about wildlife resources. Many variations of the interactions between over-exploitation and habitat destruction have severely marred our past record of resource management.

Several years ago a few very dedicated individuals realized the importance of sound wildlife management, and through their efforts they created a field to govern the utilization as well as preservation of our wildlife heritage. Much knowledge has been gained since that time and many principles and philosophies have changed or have been altered during the advancement of this profession. This young profession has rapidly advanced and expanded, which indicates that the majority of the people in this country realize the importance of professional handling of their resources.

The management of wildlife resources is a very difficult and complex science. The complexities of this profession have resulted in a demand for higher education for those entrusted with this responsibility. Requirements were set up which train the interested and weed out the non-interested. Young men graduating from colleges with degrees have the basic training to handle many of these positions. Their degrees open the doors to this field of wildlife management, but after this the real test begins. The mere fact that a man holds a degree does not mean he is qualified for the job. Many college graduates are hired for research or management jobs and they fulfill the basic demands of this position, but this is the extent of their output. This situation is acceptable but not desirable. This profession is very demanding and these positions should not be just a job. We cannot do the job we need to do in 40 hours a week. Our minds and bodies must be on call 24 hours a day. If any man is not willing to give this support to his profession, he is doing the wildlife profession an injustice.

The number of men in this field is insufficient for the job that has to be done; therefore each man must do more than his share. A biologist, either in management or research should be a good public relations man for the State Conservation Commission, not just for himself or his section. He also must have a sound basic philosophy that he is willing to support and stand behind all the way. When the going gets tough and the odds are against the principles he beleives in, this is the time to remain strong and not step aside. Those that step aside under stress cause hardships for the whole profession. We must always do our job the best we can no matter what happens - even if things go against us. The point is not to give up but to continue to sell the right program. This is the responsibility we must accept when we engage in functions of this field. I feel I cannot stress strength of conviction, integrity, and hard work nearly enough even if I devoted this whole presentation to this.

The lack of awareness and conviction by men in this field has allowed policies to be enacted and some practices to come into being that directly endanger our resources. Thus it behooves everyone, both in administrative and field positions, to keep up communications and to make our feelings known before it becomes too late. Certain situations can be avoided by a sound progressive program.

The scope of professional responsibility covers a wide spectrum of conservation activities. We cannot be current on all fields, but we must maintain our knowledge of the major advancements and principles that are working around us. Due to the forces that are in operation to defeat our goals, it becomes necessary for professionals to unify their forces and stand as a united front. This requires all wildlife biologists to be interested, aware and active in all matters that affect our programs. We must stress the need for professional attitude and strong convictions. It makes little difference what degrees you hold if you are not willing to work hard and firmly express your ideas when they are needed. Without forcefulness in this field, the profession of wildlife management would be stripped of its effectiveness.

We biologists have involved and complex responsibilities to see that the sportsmen in this country are allowed to enjoy the resources in a manner compatible with the sound management of wildlife populations. In most instances we are responsible for collecting biological data and proposing season recommendations. These season recommendations must be biologically sound, but they also must include our judgement of influencing factors. Biologists have at times been ordered to come up with only biological recommendations and told that they must not consider other factors. We cannot do this. Many times our impressions and knowledge of certain ramifications of these seasons are superior to those of administrators, and if our recommendations are going to be of value to our administrators, we must fully utilize our knowledge. We are held responsible for the results of such seasons; therefore, our decisions must be adjusted to existing conditions. There are several instances where sound biological recommendations have been laughed out of the room because of the impact they would have on the public. Thus our professional advisements and recommendations must be tempered to the understanding of the whole situation. We are held responsible for our actions; thus we cannot afford to make judgements that are wrong. Obligations dictate that we produce recommendations that are biologically sound and yet appreciative of existing conditions. Then we must back these to the fullest extent of our power.

All biologists are guilty of not working to their fullest capabilities; however, circumstances often surround certain situations that limit an individuals effectiveness. One of the biggest problems that surround men in this state is the lack of funds for adequate manpower to accomplish the work load that needs to be done. We find ourselves at times doing work that could be done by a laborer and thus neglecting to be current and active on more important problems. If wildlife management biologists are going to promote their profession, they cannot be maintenance men. The research needs and wildlife coordination work that is needed cannot be accomplished by our present biologists because of the lack of manpower. Our program is small and therefore results are few, but we are judged by accomplishments. There is a definite need for more funds to increase salaries in order to attract and hold good men and to hire more help to conduct a good progressive program. This is a problem that affects all of us and we should strive to correct it.

Along with a good management and research program there is a great need for a strong public relations program. We can do an outstanding job of finding answers and answering problems, but if we do not sell the information we will not accomplish our goals. The public relations aspect of wildlife management is probably the most important single part of the overall program today. In most cases the number of public relations men is small and the need for increased help is large. If the information that we believe in is to be put in action we must help sell it. All professional men should be active in public relations by going to local as well as regional meetings, giving talks, and explaining the reasons behind our decisions to the average public. This is your professional responsibility. If you desire to further your profession as well as yourself, you must accept these responsibilities.